AN ECONOMETRIC STUDY OF CONCENTRATION IN MANUFACTURING INDUSTRIES OF HONG KONG

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ABSTRACT

Market structure is important in economic analysis. In Hong Kong, according to its industrial census data of 1973 and 1978, manufacturing establishments with 100 or more persons engaged had supplied more than half of the total census value added and earned higher price-cost margins, but they accounted for less than five percent of total number of establishments. This shows that the production capacities are concentrated in a few large establishments and they may possess certain kind of market power. The present study aims at studying the effect of market structure on profitability. Four manufacturing industry groups in Hong Kong, namely, food manufacturing, manufacture of electrical and electronic products, textiles manufacturing, and manufacture of fabricated metal products, are chosen for analysis. This study is done for 1973 and 1978.

Econometric models were built to estimate the effect of concentration on price-cost margins. Both ordinary least-squares (OLS) and seemingly unrelated model estimation methods are applied to the equations. We found that the average price-cost margins of the three largest establishments in an industry was positively related to concentration measures of that industry in cross-section studies of 1973 and 1978. However, the change of price-cost margins between the two years could not be explained by the change in concentration measures except in the case of food manufacturing industries.

In the cases of textiles manufacturing and the manufacture of electrical and electronic products, labour productivity was the most important factor affecting price-cost margins in addition to the

concentration measure. Advertising expenditure, a barrier of entering a particular market, was found to be significant in explaining variation of price-cost margins in the case of food manufacturing industries. Moreover, trade variables did not play any significant role.

Findings of the study suggest that the selected manufacturing industries in Hong Kong had not behaved as closely as what has been predicted by the theory of perfect competitive market. To increase competitiveness of the economy, the creation of a more competitive environment is needed. As small establishments are always in unfavourable positions to obtain loans and informations on new technology, a more convenient loans program and an introduction of new technology to small establishments are suggested so that they may compete with large establishments. Some programs such as the loans to small establishments program led by the Hongkong and Shanghai Banking Corporation recently and exhibitions of new products are now carrying out and these programs are more favourable to small establishments. What is needed is the further strengthening of these programs so that the results will be more satisfactory.

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CHAPTER I

INTRODUCTION

Theory of Competition and Industrial Organization

Profit is one of the most important items in the theory of firms. Economic theory very often assumes firms try to maximize their economic profits. This assumption leads to the conclusion that we can have the most efficient way of allocating resources in a perfectly competitive market.

We are not virtually in a perfectly competitive market, however. Every firm has its more or less monopolistic power, and makes profit out of its special features. Certainly, the profit of a firm is not only affected by the distinctive characteristics of its products, but also its managerial efficiency, marketing and high productivity. In economics, special emphasis is placed on the analysis of market structures. We have models of monopoly, oligopoly and monopolistic competition. Firms with different degree of monopolistic power can be assigned to different market structures. However, these market structures are considered to be less satisfactory than perfect competition in resource allocation and income distribution aspects, so that we pay particular attention to the analysis of market structure.

Both economic theory and industrial experience suggest that the structural features of an industry strongly influence the competitiveness among its constituent firms and consequently their prices, profits, and output levels. Nevertheless, market structure is only a theoretical concept and is difficult to add quantitative content to it or to

describe characteristics of various market structures using a single indicator. In practice, concentration of a market is always used to approximate the structure of a particular market. By concentration, we mean the shares of activities of dominant firms in the market. If the shares of activities of a certain number of firms are high, the power of these firms is great, and they are able to manipulate the market easily. They are called dominant firms. Hence concentration indicates the extent of oligopolistic power of dominant firms, although it fails to tell some aspects of oligopolistic market, such as price collusion actions and welfare loss of consumers. Dominant firms in a more concentrated market[1] are likely to yield higher rates of return even though the prices of their products are not far above those of their competitors.[2] A study of Bain[3] suggested that when the output of the eight largest firms of an industry exceeded seventy percent of the total output of the whole industry, these firms were likely to yield higher rates of return than their smaller counterparts. This study will be reviewed in detail in the next chapter. On the other hand, in a keenly competitive environment, firms are likely to yield lower rates of return. Economic theory suggests that in a perfectly competitive market, the constituent firms will adjust their scales of production to the extent that the price of the product equals the long-run marginal cost of production, which is equal to the long-run average cost of production as well. So that every firm in the market earns a 'normal profit' only and is not able to earn 'extra profit' as those in monopoly and oligopoly markets. Market structure necessarily influences the behaviour and performance of firms in a market and in turn reflects the allocative efficiency of the economy. In the extreme case of monopoly, economic theory shows that monopoly leads to higher price and lower output compared with competitive supply. Thus it results in efficiency loss.

Economists are always concerned about market efficiency, and they are particularly interested in the analysis of the relationship between the behaviour and performance of firms and how their performance may be influenced by market structure. One indicator of performance of the firms is their price-cost pattern — and this is the main theme of the present study.

Purpose of the Study

A competitive market is usually associated with free entry and numerous number of firms so that none of the firms can dominate or manipulate the market. Because of the insignificant monopolistic power in this type of market, the degree of concentration does not affect the profit level of firms.

A number of studies indicated that profit levels of firms were directly related to the concentration level of an industry although their relationship might be weak or insignificant. A majority of the studies were performed in large and relatively closed economies such as the United States. Recent studies in Indian[4] and Malaysian[5] manufacturing industries showed that trade sectors did have effects on the profit levels of firms.

Hong Kong has managed to sustain a high rate of growth for nearly three decades in a freely competitive environment. It imposes no trade barriers such as tariffs or quotas on almost all imported goods although some goods such as tobaccos are subjected to import duties. All firms face keen competition from foreign commodities.

As stated in the previous section, it seems that large firms are likely to yield higher rates of return in Bain's study. However, the case cannot be generalized to all countries which may be under very different environment. In Hong Kong, so far there exists no systematic study on the effect of concentration on profitability. As we will see

in chapter three, some of the industry sectors in Hong Kong are quite concentrated. Under the unique circumstance of Hong Kong, we would like to see whether a higher rate of return can be explained by concentration. We would also like to find out what role trade factors play in explaining firm's rate of return. In the present study, four manufacturing industry groups in 1973 and 1978 are chosen for the above-mentioned purposes. The chosen industry groups are food manufacturing, manufacture of electrical and electronic products, textiles manufacturing, and the manufacture of fabricated metal products. The main reason of choosing manufacturing industries is that products in this sector are more homogeneous and may explain the theory of competition better than the tertiary sector.[6] Moreover, the primary sector is unimportant in Hong Kong.[7]

We are going to test the hypothesis that the rate of return of the largest establishments in an industry is related to concentration of that industry. If the hypothesis is rejected, we can conclude that the market power of these establishments is very weak so that even they account for the largest shares of activities in the market, they do not get any benefits from their relatively weak market power. If the hypothesis is accepted, we can conclude that the largest establishments have certain degree of market power so that they can have higher rates of return. As concentration is not the only element affecting profitability, another purpose of the present study is to see the effect of other influential factors on the profit levels of firms in manufacturing industries. Factors considered other than concentration are advertising, economies of scales, productivities, trade and growth. The plan of study is described in the following.

Plan of the Study

The present study aims to build econometric models to test the structure-performance relationship in the manufacturing industries in Hong Kong. Before testing the relationship, we would like to know the situation of manufacturing industries in Hong Kong. Chapter three examines the degree of concentration in selected manufacturing industries. Measurements of concentration, their merits as well as limitations, will be discussed. Moreover, between 1973 and 1978, the degree of concentration in selected industries had changed and we will have a brief review over them. In chapter four an analytical framework is described and we will state the variables to be considered in our model, their expected effects on profitability, and how they are measured. Chapter five presents the cross-section results of our estimation. Interpretations of the estimation results will be given. Chapter six discusses factors affecting the change of price-cost margins of firms between 1973 and 1978. We will have interpretations of the results and comparisons made for the results obtained in chapters five and six. Finally the study ends with conclusions, findings of our estimation, policy implications and limitations of the study. In the following chapter, a brief review of previous studies on profit-concentration relationship is presented.

FOOTNOTES TO CHAPTER I

[1]What we meant by 'concentrated' market is in conceptual and relative sense and there is no absolute standard to tell whether a market is 'concentrated' or not. For example, when three largest among the total 107 establishments in the manufacture of electrical and industrial machinery and apparatus in 1978 contributed 77 percent of total census value added of the industry, the industry can be considered as 'concentrated'. When the three largest among the total 1,414 knit outerwear mills contributed only 6 percent of total census value added of the industry in 1978, the industry is classified as 'not concentrated'.

[2]This is especially true for a dominant firm pricing model, where the dominant firm sets its price and output levels according to its

marginal cost and marginal revenue to maximize its profit, and the remaining firms follow its price.

[3]Joe S. Bain, "Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940", The Quarterly Journal of Economics, vol. 65 (August 1951), pp. 293-324.

[4]Homi Katrak, "Industry Structure, Foreign Trade and Price-Cost Margins in Indian Manufacturing Industries", The Journal of Development Studies, vol. 17 (October 1980), pp. 63-79.

[5]Wee-Beng Gan and Siew-Yen Tham, "Market Structure and Price-Cost Margins in Malaysian Manufacturing Industries", The Developing Economies, vol. 15 (1977), pp. 280-292.

[6]The theory of competition always assumes homogeneous product in a market. Output of the tertiary sector seems to be more heterogeneous than that of the manufacturing sector. Moreover, output of the tertiary sector is difficult to measure and compare among different firms.

[7]The share of the primary sector in the gross domestic product of Hong Kong never exceeds two percent since the 1970's and the share is declining. See Census and Statistics Department, Estimates of Gross Domestic Product 1966 to 1981, Hong Kong: Government Printer, 1983, p. 39.

CHAPTER II

A BRIEF REVIEW OF THE STUDIES ON THE PROFIT-CONCENTRATION RELATIONSHIP

The study of profit-concentration relationship had not become popular until Joe S. Bain presented his seminal study in 1951.[1] Yet the field stemmed from the rise of competition theory much earlier. Earliest studies of this kind were performed by the U.S. Bureau of Corporations concerning many U.S. industries with high degrees of market power in the early twentieth century. The studies gained much more attention in the 1930's when Edward Chamberlin and Joan Robinson's publications[2] had shaken the firm base of the theory of perfect competition. A number of studies came out since the 1950's and this chapter gives a brief review of them.

The Pioneering Studies

Joe S. Bain

In his seminal article, Bain used statistical techniques to test his hypothesis:

> The hypothesis in brief is that the average profit rate of firms in oligopolistic industries of a high concentration will tend to be significantly larger than that of firms in less concentrated oligopolies or in industries of atomistic structure.[3]

Bain employed the data obtained from a selected sample of forty-two manufacturing industries and 335 firms in the United States from 1936 through 1940. He first calculated the proportion of value product supplied by the eight largest firms in every industry selected in 1935. Then 1936-1940 industry average profit rates after income taxes

were computed. By investigating the two sets of figures, he found that there was no conclusive indication of relationships between concentration and profit rates.

He then separated the industries into two groups. One group included those industries with eight-firm concentration ratios over 70 percent, and the remaining belonged to the other. He computed the average industry profit rates for these two groups and compared the means of them by applying the Fisher z test. The average profit rate of the more concentrated group was found to be significantly higher than the other group. The result of the z test showed that there was less than one-tenth of one percent probability that this dicotomy could be accounted for by random factors.

Bain's study, though simple, pointed out the notable feature of the role of industrial concentration. He also paid attention to other determinants of profit rates such as the size of firm, the proportion of overhead costs, the relative importance of capital assets, the durability of the good, and the character of buyers. He did not treat these factors in detail in his article, but in his later studies.[4]

Besides the above mentioned factors, Bain put special emphasis on the barriers of entering the market.[5] Since the monopoly and oligopolistic markets are characterized by high entry costs, emphasis on entry barriers pave the way of study from the 1960's onward.

Collins and Preston

A lot of studies had been done concerning industry concentration in the 1950's and the 1960's.[6] However, the large body of literature dealt with concentration measurements and problems of oligopoly and monopoly. There were relatively few examples of systematic analysis and empirical works of the relationship between structure and performance.

Norman R. Collins and Lee E. Preston[7] pioneered systematic econometric analysis of concentration-performance relationship. In two of their studies on the American manufacturing industries, they built their model by their own assumptions. They hypothesized that the profit margins were attributed to three factors: concentration of the industry, capital-output ratio of the industry, and the geographic dispersion factor. Regressing profit indicators on these variables, they made conclusions in their studies as follows:

> our analysis....tends to confirm the conclusions of previous studies indicating a statistically significant, but not always strong, association between concentration and indicators of profitability in manufacturing industries.[8]
>
> Four-firm concentration appears to be significantly associated with inter-industry differences in price-cost margins, whether or not differences in capital-output ratios and other variables are taken into account.[9]

The work of Collins and Preston had important contributions:

Firstly, they summarized the past studies and used econometric technique instead of simple analytical tools used previously. The use of econometrics add more concrete analysis to descriptive discussions. Although they were not the first ones to use econometric method in this field,[10] their work remained the most comprehensive and systematic one since the 1950's.

Secondly, they used aggregate data for estimation purposes. Previous studies used data of individual firms for analysis. Though it is desirable to use individual firm data, researchers often face difficulties in obtaining individual firm data. The reason may be that firms are reluctant to release their profit data, or they find no interest in participating in such analysis. Besides, it is costly to conduct large-scale surveys. The use of aggregate data reduces the cost of research, and aggregate information is easier to obtain from censuses.

Thirdly, the profit levels of firms and industries are not always available. Collins and Preston are the first to construct price-cost margins to measure profits of firms. The price-cost margin is essentially the difference between gross revenues and direct costs expressed as a percentage of revenues. The price-cost margin method of approximating profit can also be calculated on an aggregated basis. Moreover, it gives a direct estimate of the Lerner measure of monopoly,[11] namely, (price minus long run marginal cost)/ price.

Fourthly, they realized the differences among different industries, so they estimated different equations for different industry groups. Their study selected ten groups of industries, classified by the two-digit Standard Industrial Classification (SIC), including food and kindred products, stone, clay and glass products, primary metal industries, fabricated metal products, electrical machinery, miscellaneous manufacturing and four other additional industries. The separation procedure yielded diverse conclusions for different industry groups.

This procedure has an influence on later studies including the present one, in which researchers perform estimations for individual industry groups, or use dummies to represent different kinds of products.

Development of the Field Since the Late 1960's

Consideration of Other Determinants of Profitability

The profitability of firms depends not only on the concentration of the industry, but also on other interacting variables such as barriers of entry, growth and trade. The studies from the 1960's onward centered on the effects of the interacting variables besides concentration measures, and we will discuss these variables in two aspects, one is static and the other dynamic.

(i) The static aspect

The most frequently mentioned interacting variables in the literature are the barriers of entry. Only when the cost of entry is high can the market remain oligopoly or monopoly. Therefore, the entry barriers are important determinants of the market structure.

The major entry barriers mentioned in economic literatures are size of firms[12] and advertising intensity.[13]

The absolute size of firms seems to affect their total profits rather than profit rates. Nevertheless, the increase in capital investment will not only affect the absolute amount of profits, but the earnings per dollar of investment if the increased investment can put the firm in a higher echelon of imperfectly competing capital groups. Moreover, a large amount of capital requirement for establishing new firms prevents new competitors from entering the market. Thus the dominant firms can manipulate the market much easier.

The advertising intensity has a dual role in affecting the market structure. On the one hand it shifts the demand of consumers and enlarges the size of the market so that firms have more chances to earn more profit. On the other hand, new firms may find it pays to advertise their new products. They may be able to give good impressions to consumers and swing consumers' preferences away from some leading firms. So that high advertising in an industry influences the profit rates of leading firms.

(ii) The dynamic aspect

Recent studies also stress upon the importance of the dynamic aspect of the market such as growth and development.

The growth of demand will inevitably affect the market structure. A rapid growing industry will weaken the monopolistic power of dominant

firms by enabling new firms to enter the market because of larger chances to sell their products. The more intensified competitive environment will have a negative effect on profitability.

It is also hypothesized that the change in profit can only be explained by the unexpected growth of the market demand. Leading firms can make adaptations to expected growth, but not to the unexpected components. Let us assume that the constituent firms of a market set prices competitively by equating short-run marginal cost to price. A given unexpected shift in demand would produce a larger change in the margin of price over average cost if the short-run marginal cost curves of the industry are more steeply sloped.[14]

Some economists argue that when all other things being equal, growth of industry demand would exert a positive influence on price-cost margins for two reasons. First, firms in rapid growing industries are less likely to feel competitive pressures than those in industries experiencing slow growth or stagnation, and thereby accrue temporary windfall profits. Second, in oligopolistic industries where fixed cost are relatively high, slow growth or decline in demand may cause the breakdown of collusive and joint-profit-maximization pricing behaviour, thus leading to lower price-cost margins.[15]

Effects of Trade Factors

The involvement of trade affects the market structure of the domestic economy. It is widely accepted that import trade will reduce the monopolistic power of the domestically dominant firms, and increase the competitiveness of an industry. This will lower the profit rates of the dominant firms as well as the whole industry.

As for the role of export trade, opinions are quite diverse. In the presence of export opportunities, oligopolists may be unable to exert price discrimination policies between domestic and foreign

markets, or they may be less conscious of their mutual interdependence in the domestic market. If this case is true, the profit rates will be lowered.

On the other hand, if a monopolist is capable of international price discrimination and at the same time the world demand curves are more elastic than the domestic one, then an expansion of exports will cause the domestic price to rise besides capturing profit from foreign countries. This results in an increase in profitability due to export opportunities.[16]

Besides examining the variables, recent studies also emphasized on techniques of estimation.

The Use of Econometric Techniques

The econometric studies of profit-concentration relationship in the 1950's and the 1960's mainly applied the ordinary least-squares (OLS) method as an estimation tool. Recent studies try to build up models of simultaneous-equation system by assuming that the determinants of profitability are influenced by profitability itself as well as other factors. Hence they must be simultaneously determined.[17]

Some researchers, other than build up simultaneous-equation models, make use of the correlation of disturbances across equations. They estimate one equation for each country and estimate the parameters by using generalized least-squares (GLS) method to obtain more efficient estimators.[18]

Still other researchers take advantages of the prior information in estimating models. Under a squared error loss measures, the Stein-rule estimator which combines the least-squares and restricted least-squares estimators dominates and is uniformly superior to the traditional pretest estimator. Researchers can make use of this property and replace the traditional pre-test estimators by the Stein-rule estimator.[19]

Empirical Studies of Open Economies

As we have mentioned in the previous section, earlier studies of concentration-profit relationship were mostly performed for large and assumed closed economies such as the United States and neglected the effect of trade. To serve as references of Hong Kong, some studies of open economies are summarized in the following.

The study of Esposito and Esposito[20] was the first study which examined the influence of foreign competition on profitability. They specified several models and used ordinary least-squares (OLS) method to estimate the effects of the variables consisting of concentration ratio, ratio of imports to domestic value of shipments, minimum efficient scale, absolute capital requirement, market growth, advertising sales ratio and regional distribution dummy on profit. They used 1963-1965 data of the United States for analysis and found that imports significantly reduced profitability of the consumer goods industries. But for the producer goods industries, imports seemed to have no effect on profitability.

The economy of the United States may be too large when compared with Hong Kong. To see the case of small economies, two studies concerning the manufacturing industries of Malaysia are summarized as follows.

The studies[21] on the Malaysian manufacturing industries using 1968 and 1971 data showed that only when four-firm concentration ratios exceeded 55 percent with eight-firm concentration ratios less than 85 percent would the price-cost margins attain a higher level, in spite of the fact that the results indicated that the impact of concentration ratio on profitability was weak.

The studies also discovered that barriers to entry measured by minimum efficient scales, absolute capital requirement, and advertising

sales ratios had a positive and significant influence on inter-industry differences in price-cost margins, and that international trade had considerable impact on domestic profitability. Industries protected by tariff barriers had higher price-cost margins whereas industries which were export-oriented displayed more competitive price behaviour. Direct administrative control on entry into certain industries resulted in high price-cost margins. The growth of demand had a positive effect on margins.

As for the present study, the methodology of Collins and Preston is closely followed, and it also takes into consideration the interacting variables which are found important both in theoretical analysis and empirical works.

FOOTNOTES TO CHAPTER II

[1]Joe S. Bain, "Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940", The Quarterly Journal of Economics, vol. 65 (August 1951), pp. 293-324.

[2]Edward H. Chamberlin, The Theory of Monopolistic Competition, Cambridge: Harvard University Press, 1933; Joan Robinson, The Economics of Imperfect Competition, London: Macmillan, 1933.

[3]Joe S. Bain, op. cit., p. 294.

[4]For example, _____. Industrial Organization, New York: John Wiley & Sons, Inc., 1959.

[5]For example, _____. Barriers to New Competition, Cambridge: Harvard University Press, 1965.

[6]There were some surveys during this period such as G. Rosenbluth, Concentration in Canadian Manufacturing Industries, Princeton: Princeton University Press, 1957; R. Evely and I.M.D. Little, Concentration in British Industry, Cambridge: Cambridge University Press, 1960; and Ralph N. Nelson, Concentration in the Manufacturing Industries of the United States, New Haven: Yale University Press, 1963.

[7]Norman R. Collins and Lee E. Preston, Concentration and Price-Cost Margins in Manufacturing Industries, Berkeley: University of California Press, 1968.

[8]Ibid., p. 107.

[9]_____. "Price-Cost Margins and Industry Structure", The Review of Economics and Statistics, vol. 51 (August 1969), p. 283.

[10]Leonard W. Weiss, for example, used econometric technique earlier. See Leonard W. Weiss, "Average Concentration Ratios and Industrial Performance", Journal of Industrial Economics, vol. 1, No. 3 (July 1963), pp. 237-254.

[11]Abba P. Lerner, "The Concept of Monopoly and the Measurement of Monopoly Power", Review of Economic Studies, vol. 1, Nos. 1-3 (1933-34), pp. 157-175.

[12]Marshall Hall and Leonard Weiss, "Firm Size and Profitability", The Review of Economics and Statistics, vol. 49 (August 1967), pp. 319-331.

[13]For early studies, see Joe S. Bain, Barriers to New Competition, Cambridge: Harvard University Press, 1965; for recent studies, see Allyn D. Strickland and Leonard W. Weiss, "Advertising, Concentration, and Price-Cost Margins", Journal of Political Economy, vol. 84, No. 5 (October 1976), pp. 1109-1121.

[14]This is pointed out in Ralph M. Bradburd and Richard E. Caves, "A Closer Look at the Effect of Market Growth on Industries' Profits", The Review of Economics and Statistics, vol. 64 (November 1982), pp. 635-645.

[15]Javad Khalilzadeh-Shirazi, "Market Structure and Price-Cost Margins in United Kingdom Manufacturing Industries", The Review of Economics and Statistics, vol. 56 (February 1974), pp. 67-76.

[16]The case is first pointed out by Richard E. Caves, as quoted in Emilio Pagoulatos and Robert Sorensen, "Foreign Trade, Concentration and Profitability in Open Economies", European Economic Review, vol. 8 (October 1976), pp. 255-267.

[17]A good example can be found in Allyn D. Strickland and Leonard W. Weiss, op. cit.

[18]Emilio Pagoulatos and Robert Sorensen, op. cit.

[19]Leonard W. Weiss, for example, tried to improve the Collins-Preston work by building up restricted models and performed James-Stein estimates based on the Collins-Preston models, as quoted in Dennis J. Aigner and George G. Judge, "Some Applications of Pre-Test and Stein Rule Estimators to Economic Data", Social Systems Research Institute Workshop Paper, no. 7512, University of Wisconsin, April 1975, pp. 28-35.

[20]Louis Esposito and Francis F. Esposito, "Foreign Competition and Domestic Industry Profitability", The Review of Economics and Statistics, vol. 53 (November 1971), pp. 343-353.

[21]Wee-Beng Gan, "The Relationship Between Market Concentration and Profitability in Malaysian Manufacturing Industries", Malayan Economic Review, vol. 23 (April 1978), pp. 1-13; _____. and Siew-Yen Tham, "Market Structure and Price-Cost Margins in Malaysian Manufacturing Industries", The Developing Economies, vol. 15 (September 1977), pp. 280-292.

CHAPTER III

INDUSTRIAL CONCENTRATION IN HONG KONG

Before we analyse the effect of concentration, we must know first whether concentration problem exists. In this chapter, we will analyse the degree of concentration in selected manufacturing groups in Hong Kong for 1973 and 1978 — the years over which our study covers. The pattern of change in concentration will also be discussed.

Distribution of Firms

One cannot conclude whether a market is oligopolistic, monopolistic or in a state of perfect competition without examining the distribution of firms in the market. The distribution of firms often refers to the distribution of different sizes of firms in a specific market.

In Hong Kong, we find that in terms of number of establishments, the manufacturing industries are dominated by small firms.[1] As we can see from Table 1, over 90 percent of the manufacturing establishments in Hong Kong were with less than one hundred persons engaged in both 1973 and 1978. Four industry groups which consist of food manufacturing, manufacture of electrical and electronic products, textiles manufacturing and the manufacture of fabricated metal products, are chosen because of their importance in the Hong Kong economy. We have not chosen the garment industry, the largest industry in Hong Kong, for analysis mainly because the International Standard Industrial Classification

TABLE 1

PERCENTAGES OF SELECTED COMPONENTS CONTRIBUTED BY ESTABLISHMENTS WITH LESS THAN 100 PERSONS ENGAGED IN HONG KONG MANUFACTURING INDUSTRIES

Industry	1973				1978			
	Number of establish-ments	Persons engaged	Sales and work done	Census value added	Number of establish-ments	Persons engaged	Sales and work done	Census value added
Overall	95.4	45.3	38.6	37.7	96.8	54.4	45.4	48.1
Food	97.9	71.1	68.7	65.4	97.3	64.2	N.A.[a]	N.A.[a]
Electrical and electronic products	83.6	20.2	16.9	17.5	87.6	25.0	19.0	19.5
Textiles	91.8	31.4	21.3	20.6	96.0	50.7	39.3	44.8
Fabricated metal products	97.6	57.5	54.0	51.2	98.7	68.5	64.7	64.6

Source: Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, 1977.

_____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, 1981.

[a]Not available.

(ISIC) made a change in defining industry sectors in the manufacture of wearing apparel between 1973 and 1978, thus a comparison of the results between the two years is impossible.

In terms of employment, small establishments employed slightly more than half of total employees engaged in manufacturing industries in 1978 while the share was 45.3 percent in 1973.

In terms of the contribution to production capacities and sales volume, small establishments contributed more than half of total sales and work done and total census value added in food manufacturing industries and the manufacture of fabricated metal products. However, the relative contribution of small establishments were lower in textiles manufacturing industries and the manufacture of electrical and electronic products, they accounted for less than one quarter of total sales and census value added in 1973. Nevertheless, the shares of small establishments in the latter two groups rose in 1978 and the gain in textiles manufacturing was significant.

Perhaps the most notable feature of the uneven distribution of establishments is the differences in labour productivities. By examining the shares of different activities, we find that small establishments are more important in employment aspect than in production aspect. The lower shares of value added in industries than the corresponding shares of persons engaged for these small establishments reflected that the average labour productivities per worker were higher in larger establishments.[2]

Small establishments contribute much to the flexibility and adaptability to industries of Hong Kong because subcontracting system is popular in Hong Kong and they have been praised of their supporting functions to large establishments. However, their importance in this aspect should not be over-emphasized.

Data for both 1973 and 1978 revealed that the majority of output in Hong Kong manufacturing industries was produced by a few percentages of large establishments. In spite of the competitive environment in Hong Kong, large establishments must possess some advantages over the small ones since we observed that price-cost margins of leading establishments were higher.[3] Discussions on the determinants of price-cost margins will be given in later chapters.

In Table 2, we have computed indexes of labour productivities for small establishments. Here the labour productivity is defined as census value added per person engaged. The indexes are computed by dividing the average labour productivity of small establishments by the average productivity of large establishments, while the latter is adjusted to 100. The overall labour productivity of small establishments were less than eighty percent of that of large establishments in both periods studied.

From Table 1, we observe a change in distribution of firms between 1973 and 1978. With the exception of food manufacturing industries,[4] shares of small establishments in number of establishments, persons engaged and production capacities had increased. However, in Table 2, it was found that these increases had not lowered their labour productivities relative to large establishments but, conversely, had improved at the aggregate levels. The index rose from 73.1 to 77.7, although the changes varied among individual industry groups.

The number of establishments, persons engaged as well as production capacities for small establishments in 1978 did not suggest any structural change in the pattern of distribution of firms because the majority of output supplied was still essentially concentrated in a few percentages of large establishments in 1978 and their dominant positions remained strong.

TABLE 2

INDEXES OF LABOUR PRODUCTIVITIES IN MANUFACTURING ESTABLISHMENTS OF HONG KONG WITH LESS THAN 100 PERSONS ENGAGED[a]

Industry	1973	1978
Overall	73.1	77.7
Food	76.2	N.A.[b]
Electrical and electronic products	83.8	78.0
Textiles	56.7	78.9
Fabricated metal products	77.5	83.9

Source: Computed from figures in table 1.

[a]The average labour productivity in establishments with 100 or more persons engaged is set to be 100.

[b]Not available.

Measurements of Concentration

In order to see clearly the market structure, we divide data of an industry into strata according to the distribution of different sizes of firm. One should be able to obtain a good feel of the market structure if the stratification is fine enough.

However, there is a problem in this approach. It does not give an aggregate indication of the degree of concentration. One cannot tell which industry is more concentrated if he only knows different size of firms. For this reason, economists construct indexes to show the degree of concentration. The idea was stated clearly by Scitovsky:[5]

> Measures of concentration try to express the number and size distribution of competitors in terms of a one-parameter index, which could then be regarded as a direct measure of the degree of oligopoly.

Summary indexes of concentration are always constructed for comparing concentration among different industries as well as industries in different countries. The indexes are also regarded as conceptual measurements of the market structure. The following sections will give a brief discussion of these measurements.

(i) Number of firms

Obviously, the most convenient measure of the market structure is the number of firms in an industry. If there are numerous firms in an industry, we cannot say that the industry is monopoly.

However, we must run the risk of taking the number of firms in an industry as an indicator of the market structure. Since the number of firms gives equal weights to every firm in the industry, it does not provide information on the size of the firms. Two industries with equal numbers of firms may be of very different market structures — one may be dominated by one large firm and the other may have equally-sized firms.

Besides the number of firms in an industry, the most commonly used indexes for measuring concentration are concentration ratio, Gini coefficient and Hirschman-Herfindahl index, which are briefly explained in the following.

(ii) Concentration ratio

Concentration ratio is a traditional measure of market structure. It is defined as the percentage share of the n largest firms in the total activity (sales, employment, capacity, etc.). The concentration ratio reflects the degree of dominance of the n largest firms. The major defect of this measure is that it does not reflect the distribution of the remaining small firms in an industry. Nevertheless, concentration ratio is easy to compute since one only needs to know

the data of the largest n firms and data of the whole industry. The knowledge of distribution of firms is not required. Furthermore, if our purpose is to estimate the degree of oligopoly, the concentration ratio serves as a satisfactory approximation. When the concentration ratio of an industry is high, the industry can be said to be dominated by a few leading firms. When the ratio is low, the industry must be more competitive.

(iii) Gini Coefficient

Another measure of concentration is the familiar Gini coefficient. The Gini coefficient emphasizes the size inequality of firms in an industry. It can be illustrated with the help of Figure 1. We arrange the firms in an industry in order and rank them from the smallest one. Then we compute the cumulative percentages of firms on the horizontal axis and their corresponding cumulative percentages of shares in the total activity on the vertical axis. The diagonal line in the diagram represents absolute equality of firms in the industry since a certain percentage of firms always has a corresponding equal percentage of contribution in the total activity.

The combination of cumulative percentages of firms and corresponding cumulative percentages of contribution to total activity yields the well-known Lorenz curve. The ratio of the area between the line of absolute equality and the Lorenz curve, that is, the shaded area in Figure 1, to the area of the triangle below (or above) the line of absolute equality gives the Gini coefficient. Obviously, a large value of Gini coefficient indicates an uneven distribution of firms in an industry and the Gini coefficient has a value between zero and unity.

The Gini coefficient is a good indicator of distribution of firms. However, it fails to show the dominance of the few leading firms.

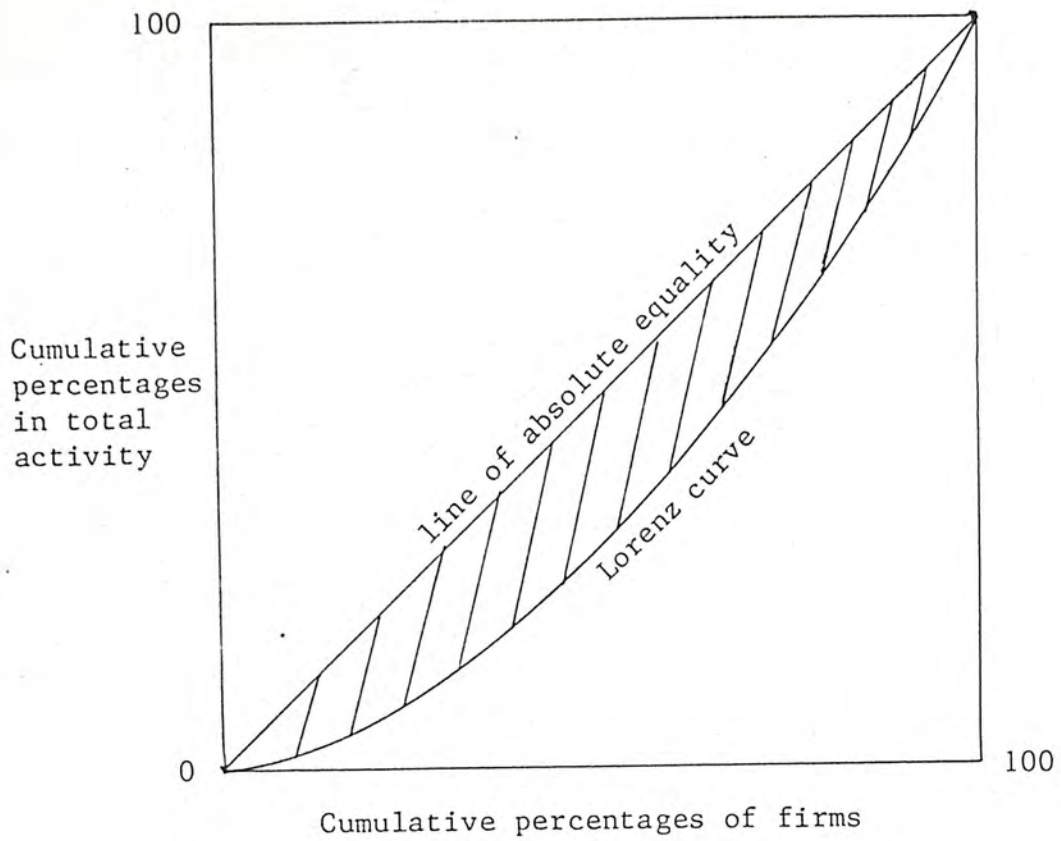


FIGURE 1: THE LORENZ CURVE

Two industries may be with the same value of Gini coefficient but dominated by different numbers of leading firms, hence with different oligopolistic structures.

(iv) Hirschman-Herfindahl Index

The Hirschman-Herfindahl index sums the squares of the shares of total activity of individual firms. This summing process weights the shares of the larger firms particularly strongly. The Hirschman-Herfindahl index lies between zero and unity. It utilizes information of all individual firms and is hence an efficient estimator of the degree of oligopoly. Moreover, since it weights larger firms stronger, it reflects the dominance of leading firms better than the Gini coefficient.

However, computation of the Hirschman-Herfindahl index requires data of individual firms, which are in general difficult to come by. The cost of computation is relatively high and it cannot be calculated when there is a lack of individual firm information. The summary indexes discussed in (ii) and (iii) can be computed from industry data.

Concentration Measures of the Hong Kong Manufacturing Industries

To gain an understanding of concentration in manufacturing industries of Hong Kong, we have calculated concentration measures for selected industry sectors. The three-firm concentration ratios are computed according to output levels. They are computed by dividing the census value added provided by the three largest establishments in an industry sector by total census value added of that sector. Since we have too many missing values,[6] to account for the distribution of value added among firms, we calculate the percentages of persons engaged and the corresponding percentages of number of establishments in different sized groups within an industry sector and estimate the Gini coefficient of that sector. The computed three-firm concentration ratios, Gini coefficients as well as number of establishments of the selected industry sectors are presented in Tables 3 and 4.

The lack of individual firm information prevents us from calculating the Hirschman-Herfindahl index. Throughout the discussion of this section, three-firm concentration ratios and Gini coefficients are used as measures of concentration in manufacturing industries in Hong Kong. The discussions of concentration are presented below for individual chosen industries.

The Food Manufacturing Industries

In terms of three-firm concentration ratios, the food manufacturing industries were quite concentrated in 1973 as shown in Table 3. More than half of the sectors in this group had three-firm concentration ratios over 50 percent. The situation remained essentially the same in 1978 as we examine Table 4.

However, several changes between 1973 and 1978 can be noticed in food manufacturing industries. Three-firm concentration ratios increased in five sectors with code numbers 3112, 3114, 3115, 3117 and 3121. For the former three sectors, increases were seen in number of establishments. In addition, the top three establishments in these three sectors were growing at rates that were faster than the industrial average.

The three industries, with code numbers 3113, 3116 and 3119 are with decreasing three-firm concentration ratios. For these industries there was no change or even a decrease in number of establishments. The changes in sectors 3113 and 3116 could be attributed to the exit of small establishments[7] while for sector 3119 the reason was mainly the increase in scale of small establishments.[8]

In terms of Gini coefficients, we find that the figures were quite low in 1973 that only sectors 3113 and 3121 had values over 25 percent. The figures rose in 1978 with only sector 3114 remained lower than 25 percent. The changes in Gini coefficients reveal that distribution of firms in food manufacturing industries became more uneven in 1978.

TABLE 3

INDUSTRIAL CONCENTRATION IN HONG KONG IN 1973

Industry sector code[a]	Number of establishments	Three-firm concentration ratio (percentages)	Gini coefficient (percentages)
Food manufacturing			
3112	14	73.37	24.36
3113	56	47.31	30.82
3114	54	33.04	23.29
3115	6	88.30	14.87
3116	134	64.54	24.83
3117	450	23.09	25.00
3119	19	71.68	23.16
3121	115	50.01	32.68
Manufacture of textiles			
3250	27	32.86	21.56
3251	61	59.46	42.43
3252	69	48.87	39.34
3260	186	25.19	34.68
3263	85	18.24	26.18
3270	75	42.22	22.54
3274	46	64.68	34.14
3275	1493	10.06	35.93
3280	155	30.94	33.35
3290	90	71.22	37.04
3212	317	19.57	35.29
3214	10	94.50	31.82
3215	32	71.49	32.53
3216	77	41.79	23.68
3217	130	20.54	19.80
Manufacture of fabricated metal products, except machinery and equipment			
3801	32	57.93	31.10
3802	174	37.26	29.13
3803	198	35.22	36.71
3804	4	97.60	10.80
3810	51	63.83	37.12

TABLE 3 - Continued

Industry sector code	Number of establishments	Three-firm concentration ratio (percentages)	Gini coefficient (percentages)
3811	225	17.70	30.50
3812	96	28.56	31.18
3813	660	9.69	14.81
3814	51	77.46	37.93
3815	60	35.36	34.82
3816	39	56.45	30.99
3817	175	49.29	36.99
3818	344	5.44	18.97
3819	1170	17.00	26.97
Manufacture of electrical machinery, apparatus, appliances and supplies			
3831	57	67.19	39.88
3832	238	21.67	34.65
3833	48	29.83	26.57
3834	133	20.00	38.08
3835	35	48.87	29.01
3836	23	86.04	40.89
3837	97	21.13	28.45
3839	164	13.07	29.65

Sources: Computed based on Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, 1977; and _____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, 1981.

[a]For definitions of industry sector codes, see Table 5.

TABLE 4

INDUSTRIAL CONCENTRATION IN HONG KONG IN 1978

Industry sector code[a]	Number of establishments	Three-firm concentration ratio (percentages)	Gini coefficient (percentages)
Food manufacturing			
3112	21	82.43	32.32
3113	50	40.92	28.92
3114	84	35.73	22.88
3115	8	89.39	25.59
3116	99	41.32	29.33
3117	359	28.39	27.08
3119	19	63.63	32.12
3121	98	58.91	37.55
Manufacture of textiles			
3250	32	32.70	14.11
3251	5	81.76	14.62
3252	3	100.00	10.28
3260	316	11.48	28.74
3263	80	15.86	15.67
3270	223	8.70	19.13
3274	35	49.28	30.20
3275	1414	5.82	33.95
3280	287	22.04	29.07
3290	194	23.96	22.79
3212	275	19.00	32.76
3214	13	92.47	40.92
3215	56	27.22	22.35
3216	163	39.52	26.03
3217	172	11.39	19.33
Manufacture of fabricated metal products, except machinery and equipment			
3801	204	31.25	35.20
3802	266	22.81	27.70
3803	255	24.89	36.42
3804	5	95.99	28.65
3810	63	57.71	34.32

TABLE 4 - Continued

Industry sector code	Number of establishments	Three-firm concentration ratio (percentages)	Gini coefficient (percentages)
3811	201	19.30	28.52
3812	160	24.23	26.56
3813	844	27.56	23.94
3814	60	57.25	33.94
3815	111	17.18	30.24
3816	92	59.93	41.09
3817	306	33.72	32.42
3818	648	6.75	17.94
3819	1411	12.05	27.46
Manufacture of electrical machinery, apparatus, appliances and supplies			
3831	109	77.42	43.58
3832	224	28.60	34.73
3833	172	27.75	34.59
3834	200	45.84	37.61
3835	102	23.39	31.32
3836	6	82.00	24.00
3837	116	33.05	30.11
3839	138	7.12	26.17

Sources: Computed based on Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, 1977; and _____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, 1981.

[a]For reason of comparability, the industry sector codes as defined in 1973 are used. For definitions of codes, see Table 5.

TABLE 5

DEFINITIONS OF INDUSTRIES SELECTED FOR ANALYSIS
(ACCORDING TO ISIC CLASSIFICATION)

Group code (1973)	Group code (1978)	Sector code (1973)	Sector code (1978)	Description
311	311-312			Food manufacturing
		3112	3112	Dairy products
		3113	3113	Canning and preserving of fruits and vegetables
		3114	3114	Canning, preserving and processing of fish and crustacea
		3115	3115	Vegetable and animal oils and fats, except lard
		3116	3116	Grain mill products
		3117	3117	Bakery products
		3119	3119	Cocoa, chocolate and sugar confectionery
		3121	3121	Manufacture of food products n.e.c.
321	325-329			Manufacture of textiles
		3250	3250	Spinning - cotton
		3251	3251	Spinning - wool
		3252	3252	Spinning - man-made fibres
		3260	3260	Weaving - cotton
		3263	3263	Weaving - labels
		3270	3270	Knitting of fabrics - cotton
		3274	3274	Hosiery
		3275	3275	Knit outerwear mills
		3280	3280	Bleaching and dyeing
		3290	3281	Textile stencilling and printing
		3212	3292	Made-up textile goods except wearing apparel

TABLE 5 - Continued

Group code (1973)	Group code (1978)	Sector code (1973)	Sector code (1978)	Description
		3214	3294	Carpets and rugs
		3215	3295	Cordage, rope and twine
		3216	3296	Threads
		3217	3297	Embroideries
380	380-381			Manufacture of fabricated metal products, except machinery and equipment
		3801	3801	Metal toys
		3802	3802	Nails, screws and hinges
		3803	3803	Tin cans and domestic utensils of metal, except aluminium
		3804	3804	Vacuum flasks
		3810	3810	Cutlery
		3811	3811	Hand tools and general hardware
		3812	3812	Furniture and fixtures primary of metal
		3813	3813	Structural metal products
		3814	3814	Aluminium utensils and articles
		3815	3815	Pressure, kerosene stoves and lanterns and accessories
		3816	3816	Torches, torch cases and parts except torch bulbs
		3817	3817	Metal watch bands
		3818	3818	Buffing and polishing and electro-plating
		3819	3819	Manufacture of fabricated metal products except machinery and equipment n.e.c.
383	383, 389			Manufacture of electrical machinery, apparatus, appliances and supplies

TABLE 5 - Continued

Group code (1973)	Group code (1978)	Sector code (1973)	Sector code (1978)	Description
		3831	3890	Electrical industrial machinery and apparatus
		3832	3832	Transistorized radios
		3833	3833	Electrical appliances and house-wares
		3834	3894	Electronic parts and components
		3835	3835	Sound reproducing and recording equipment and apparatus
		3836	3896	Dry batteries
		3837	3897	Torch bulbs, electric bulbs and tubes
		3839	3899	Electrical accessories n.e.c.

Sources: Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, vol. I, 1977, pp. 55-58.

_____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, vol. I, 1981, pp. 71-75.

The Manufacture of Textiles

Three-firm concentration ratios in textiles manufacturing industries varied widely in both years studied. It varied from 10 percent to over 90 percent in 1973 and from less than 6 percent to unity in 1978.

Generally speaking, three-firm concentration ratios in the textiles industries were quite low. In 1973, only five sectors with code numbers 3251, 3274, 3290, 3214 and 3215 had three-firm concentration ratios over 50 percent. All sectors except four (3251, 3252, 3216 and 3217) had decreased ratios in 1978. The four with increasing concentration had a common characteristic, that is, drastic decrease in numbers of establishments. With the exit of competitors, the shares of leading establishments became larger.

The same trend of decreasing concentration is reflected in Gini coefficients. All sectors showed decreases in Gini coefficients with the exception of sectors 3214 and 3217. While sector 3217 had only very slight decrease in the Gini coefficient, sector 3214 had an increase in Gini coefficient from 31.8 percent in 1973 to 40.9 percent in 1978. The overall trend showed that the textiles industries had more even distribution of firms in 1978.

The Fabricated Metal Products Manufacturing

In 1973, nine industry sectors in this group had three-firm concentration ratios over 35 percent. Yet only four sectors (3801, 3804, 3810 and 3814) among them had the three largest establishments contributed more than half of the total census value added of the industries.

The situation changed in 1978. Along with the growth of fabricated metal products manufacturing industries, all sectors except sector 3811 in this group experienced substantial increases in numbers of

establishments. Accompanied by the new entrants, all three-firm concentration ratios declined in 1978 except for sectors 3811, 3813, 3816 and 3818 whose ratios increased. The increase in ratios of these four sectors was mainly due to increases in production by the top three establishments.[9]

In 1973, Gini coefficients of nine sectors had values over 30 percent but none of them were over 40 percent. However, new entrants of the industry as pointed out above did not lead to a clear trend of more even distribution of firms. Five sectors (3810, 3804, 3813, 3816 and 3819) showed increases in Gini coefficients. For the latter three, there were also increases in three-firm concentration ratios.

Manufacture of Electrical and Electronic Products

In both periods studied, the degree of concentration in terms of three-firm concentration ratios was quite heterogeneous. The value was high and over 80 percent as appeared in sector 3836, while low and below 50 percent as appeared in sector 3839. There was no dominant trend in the changes of three-firm concentration ratios between the two periods. Half of the sectors studied attained higher values while the remaining sectors had lower values.

Gini coefficients in all sectors were over 25 percent in 1973 but only one sector (3836) had a Gini coefficient below 25 percent in 1978. No sector had a Gini coefficient over 50 percent in both years. Yet the average value of Gini coefficients in this group was the highest among the four industry groups studied in both periods. This shows that the distribution of firms in this group was relatively uneven when compared with the other three.

Just the same as three-firm concentration ratios, the changes in Gini coefficients between the two periods did not have a clear and dominant trend and we cannot make any conclusion about the trend

of changes in distribution of firms in this group although the average value of Gini coefficients was higher in 1978.

FOOTNOTES TO CHAPTER III

[1]By "small" firms, we refer to those establishments with less than one hundred persons engaged. Those establishments with one hundred persons or more engaged are referred to as "large" firms.

[2]We are not able to tell whether the difference in labour productivities in these two types of establishments came from difference in labour quality or simply because of different endowment of capital equipment since it is difficult to measure the qualities of labour as well as capital equipment.

[3]We have performed t-test to differences between average price-cost margins for the top three establishments in an industry and the average price-cost margins for the remaining establishments. It appeared that the former was significantly higher than the latter in both periods studied. The t-statistics are significant at one percent level.

[4]The changes in the shares of output in food manufacturing industries are unknown because of data inavailability.

[5]Tibor Scitovsky, "Economic Theory and the Measurement of Concentration," in National Bureau of Economic Research, Business Concentration and Price Policy, Princeton: Princeton University Press, 1955, pp. 101-113.

[6]For certain sized classes appeared in the censuses, data other than number of establishments and number of persons engaged were suppressed because of confidentiality reasons.

[7]For sector 3113, all the six establishments reduced are those with less than twenty persons engaged. For sector 3116, only three of the five establishments which had left the industry are with twenty or more persons engaged.

[8]Despite the reduction in number of establishments in this sector, the number of establishments with twenty or more persons engaged increased from four in 1973 to seven in 1978.

[9]The average growth rates of census value added for the top three establishments in sectors 3811, 3813, 3816 and 3818 are respectively 22.3, 276.1, 16.1 and 35.2 percent above those of the industrial average.

CHAPTER IV

ESTIMATION OF EQUATIONS

One of the objectives of the present study is to explore the relationship between price-cost margins and concentration. The main task of this chapter is to build econometric models and to show the process of estimating them.

Sample Selection

Our work essentially follows that of Collins and Preston [1968] as reviewed in chapter II and we shall build models for individual industry groups.

The study is done for four selected industry groups and is for 1973 and 1978. The four groups are defined at three-digit level of aggregation of the International Standard Industrial Classification (ISIC) as defined in 1973, including food manufacturing industries, textiles manufacturing industries, manufacture of fabricated metal products and manufacture of electrical and electronic products. Each four-digit level industry sector within a three-digit group is taken as an observation for estimation purposes. The use of the four-digit level industry sectors as observations is based on two considerations: one, the data for the largest three establishments within a four-digit industry are available in the censuses and it is convenient to compute concentration measures at the four-digit level; two, for theoretical or practical analysis, the four digit level of aggregation appears to be a clear approximation to meaningful economic markets than other levels of aggregation.[1]

In addition, since concentration data for other levels are not available, studies at the two and three-digit levels of aggregation have to use some weighted average concentration ratio[2] but such kind of weighted average value has some shortcomings as pointed out by Boyle.[3]

In theoretical analysis, we hypothesize that dominant firms in a concentrated market can yield higher rates of return. The hypothesis lies on a very important assumption, that is, products within the same industry are homogeneous or at least are very close substitutes. It appears that three-digit level of aggregation is too wide for products to be close substitutes. Moreover, data for five-digit level are not available. While industries within an industry group may face similar conditions and environment, those in other industry groups may operate under very different conditions. It is for this reason that we estimate different equations for different industry groups.

Definitions of the industries in the ISIC had been changed after the 1973 census. In order to make results of the two studied periods comparable, we had chosen those sectors in which there were no change in definitions. Furthermore, we discarded those sectors for which no released data were available because of confidentiality reasons. After these considerations, the sample observations we have chosen for analysis are as follows:

For food manufacturing industries, eight sectors are selected. There were totally 848 establishments in 1973 and 738 in 1978.

For textiles manufacturing industries, fifteen sectors are chosen with totally 2,853 establishments in 1973 and 3,268 in 1978.

For fabricated metal products manufacturing industries, fourteen sectors are chosen. There were 3,279 establishments in 1973 and 4,626 in 1978.

For manufacture of electrical and electronic products, eight sectors are selected. There were 795 establishments in 1973 and 1,067 in 1978.

After we have chosen our sample observations, we can build and estimate models. The variables to be used in the models are described as follows.

Variables Considered in the Model

In order to explain rates of return by the degree of concentration of industry, we employ rates of return as the dependent variables in our model. Just like those models reviewed in chapter II, interacting variables which may explain the variations in the rates of return will be considered. First, we consider the rate of return variable.

(i) The Rate of Return

There are many measurements to the rates of return of firms.[4] Some would use accounting profit of firms on equity as a measurement while others may like to measure the rate of return on sales volume. However, the use of accounting rate of return on equity as a profit measure is hazardous. This is because the accounting rates of return on equity is affected by variations in equity/sales ratios which occur as a result of variations in capital intensities or degrees of leverage, or both. These factors have nothing to do with the theoretical hypothesis relating market performance, and may only be statistically related to the dimensions of market structure but without theoretical support.

Moreover, we are not able to obtain the accounting profit data of individual firms without costly surveys, we use price-cost margin computed from census data as a proxy for profit measure. The price-cost margin is defined as the ratio of the difference between value

added and direct expenses to total volume of sales and work done:

$$\text{Price-cost margin} = \frac{\text{Value-added -Wages -Depreciation expenses}}{\text{Total sales and work done}}$$

The numerator of the price-cost margin can be viewed as the operation surplus from production process, and the price-cost margin expresses the surplus as a proportion of sales and work done.

If we assume that in the long run, firms adjust their scales of production to a stage where marginal cost of production equals minimum average cost and that sales equal unit price times quantity, the price-cost margin will be a proxy for the ratio: (price-cost)/ price. Thus the price-cost margin itself reflects the deviation of price from cost. As economic theories suggest that in a perfect competitive market, price equals marginal cost, the price-cost margin should be low. While in imperfect markets, price is likely to be above marginal cost and there will be high price-cost margins. The computed price-cost margins of our selected samples are presented in Table 6.

(ii) Concentration

In our analysis, three-firm concentration ratios and estimated Gini coefficients are used as proxies for the degree of monopoly power. Though both measures have some shortcomings, we find them acceptable in measuring concentration of industries.

To incorporate the concentration measures into our model is to capture the effect of market concentration on profitability. We expect that they are of positive relation because as described in the previous section, dominant firms in a more concentrated industry, just like those in imperfect markets, are likely to yield higher rates of return.

TABLE 6

PRICE-COST MARGINS IN HONG KONG MANUFACTURING INDUSTRIES (IN PERCENTAGES)

Sector code[a]	1973		1978	
	Top three establishments average	Industrial average	Top three establishments average	Industrial average
3112	17.30	16.54	36.34	31.72
3113	16.11	15.26	11.96	12.83
3114	9.00	13.02	8.70	11.70
3115	9.06	8.99	12.07	11.60
3116	21.23	14.20	10.08	11.02
3117	12.60	13.18	17.90	14.52
3119	16.30	9.71	13.64	13.04
3121	19.79	19.41	27.45	22.17
3250	26.55	25.55	17.18	12.23
3251	26.54	23.27	8.90	8.49
3252	30.65	24.75	14.41	14.41
3260	25.29	14.31	8.84	6.93
3263	12.84	15.99	21.95	15.28
3270	22.16	13.37	4.81	9.56
3274	9.88	11.03	8.12	10.22
3275	15.87	11.28	6.79	10.05
3280	5.73	9.67	13.02	13.92
3290	17.50	16.88	12.66	15.71
3212	20.90	12.45	18.19	12.89
3214	30.33	30.12	30.84	29.60
3215	18.71	10.10	17.20	16.06

TABLE 6 - Continued

Sector code	1973		1978	
	Top three establishments average	Industrial average	Top three establishments average	Industrial average
3216	14.91	14.80	14.43	9.87
3217	12.79	15.10	16.25	18.29
3801	23.45	19.09	13.28	13.03
3802	23.48	16.87	15.90	14.16
3803	17.85	14.81	15.91	13.00
3804	17.05	16.58	17.40	16.78
3810	26.77	20.79	26.56	21.40
3811	1.03	9.08	11.48	11.31
3812	16.84	18.20	18.43	17.04
3813	15.81	16.99	9.97	15.47
3814	24.50	23.33	15.88	13.93
3815	11.10	13.33	19.49	12.59
3816	27.84	18.24	25.69	19.30
3817	28.24	19.67	8.68	9.33
3818	8.56	16.47	8.57	15.15
3819	9.54	13.95	11.55	12.74
3831	23.55	20.32	14.89	13.68
3832	9.98	10.17	13.36	7.28
3833	18.33	14.42	19.62	15.31
3834	4.46	12.77	24.58	20.98
3835	20.19	15.29	7.52	8.09
3836	14.60	15.83	10.50	12.37

TABLE 6 - Continued

Sector code	1973		1978	
	Top three establishments average	Industrial average	Top three establishments average	Industrial average
3837	10.07	10.61	12.72	14.59
3839	8.52	11.74	8.54	13.04

Sources: Computed from Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, 1977; and _____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, 1981.

[a]For reason of comparability, the industry sector codes defined in 1973 are used. For definitions of codes, see Table 5.

(iii) Barriers to Entry

Dominant firms cannot be dominant when entry into the industry is easy and there are many new entrants. Hence, barriers to entry are important in the study of market structure. Two factors are generally considered as sources of barriers of entry: advertising intensity and economies of scale and they are discussed below.

(1) Advertising intensity

For the variables of advertising intensity, we express it as a percentage of total advertising expenditure to total sales and work done. While the absolute amount of advertising expenditure is likely to be high for an industry with high sales volume, it is not a satisfactory variable in explaining profitability. The data of advertising expenditure at firm level are not available. We use the data of advertising intensity at the industry level for analysis.[5]

High advertising intensity prevents new firms from entering the market and should hence has a positive relation with profitability. But at the same time high advertising intensity can also be used as a tool of entering the market and reduce the profitability of dominant firms and that of the industrial average as well because the market would then becomes more competitive. Therefore, the sign of the advertising intensity variable depends on the nature of the expenditure and cannot be determined beforehand.

(2) Economies of scale

Economies of scale is also a factor that prevents new firms from entering the market or competing with dominant firms. When a production unit expands to a certain scale, it can experience scale economies. In order to compete with the established firms, new entrants have to set up their production units which can capture scale economies.

In practice, economies of scales are approximated by absolute capital requirements, that is, absolute sizes of firms,[6] or minimum efficient scales of firms — minimum scales for production units to be efficient. What is meant by efficient is measured by the average cost of production. A firm may reach its lowest average cost at certain scales. If the minimum among them still requires a large amount of capital to set up, then the capital requirement will be a barrier to new entrants. The measure we use to approximate economies of scale is the cost disadvantage ratio developed by Caves, Khalilzadeh-Shirazi and Porter[7] with some modifications.

We define the cost disadvantage ratio as value-added per man-hour worked of the top three establishments in an industry divided by the value-added per man-hour worked of remaining ones with smaller plants. Obviously a higher cost disadvantage ratio indicates that smaller establishments are more or less on an equal footing with the top firms. As shown in Table 7, most industries in our sample have cost disadvantage ratios lie below unity, but some are greater than one. A low value of cost disadvantage ratio shows that small firms are in more disadvantageous position and economies of scale can be an effective barrier of entry. Thus, the relation between the ratio and profitability should be negative.

Since data on absolute capital requirements of firms are not available and the method of estimating the minimum efficient scales of production units is rather complicated, if not impossible, the cost disadvantage ratio is used as a measure of economies of scale in spite of its limitations.[8]

(iv) Productivities

Productivities of production units necessarily affect their rates of return. In our study, we have considered the effects of labour productivity, capital productivity and floor productivity.

TABLE 7

COST DISADVANTAGE RATIOS OF HONG KONG MANUFACTURING INDUSTRIES (IN PERCENTAGES)

Sector code[a]	Year	
	1973	1978
3112	80.05	27.64
3113	81.91	99.26
3114	87.91	47.43
3115	54.58	48.83
3116	10.85	35.21
3117	66.41	41.35
3119	51.06	114.04
3121	59.71	53.19
3250	79.53	68.11
3251	75.09	109.87
3252	74.71	n.c.[b]
3260	75.20	74.05
3263	112.66	74.19
3270	39.35	58.96
3274	95.53	88.35
3275	82.44	102.26
3280	70.77	68.41
3290	53.46	35.75
3212	72.94	47.44
3214	94.28	88.01
3215	81.39	90.94
3216	49.55	57.07
3217	81.82	83.37

TABLE 7 - Continued

Sector code	Year 1973	1978
3801	77.83	109.55
3802	75.13	93.26
3803	81.11	74.81
3804	72.45	73.47
3810	75.28	46.03
3811	121.70	78.20
3812	119.54	88.66
3813	94.07	52.21
3814	48.75	64.27
3815	110.48	66.38
3816	80.65	90.14
3817	86.81	73.82
3818	66.24	65.61
3819	90.10	70.61
3831	70.81	66.38
3832	79.93	65.58
3833	71.17	71.93
3834	94.39	30.03
3835	76.88	75.50
3836	120.56	144.68
3837	96.11	75.18
3839	80.18	66.31

Sources: Same as Table 5.

[a]Codes as defined in 1973 are used.

[b]Not computable.

Labour productivity is measured as value-added per man-hour worked, and capital productivity value-added per dollar of stock of fixed assets. Floor productivity is measured as value-added per square meter of floor area. This variable is included because the property price in Hong Kong was relatively high and we wish to see whether floor productivity affected the level of profitability.

It is assumed that large plants employ more capital intensive way of production and their labour productivity is higher. Assuming fixed supply of labour in a production establishment, labour per unit value of capital or unit floor area is lower if production process is more capital intensive. Capital and floor productivities will be increased or lowered depending on whether the more capital intensive way of production can yield proportional increase in total output. If the increase in total output is less than the increase in capital investment or floor area used, the capital and floor productivities will be decreased and vice versa.

When we use productivities to explain the rates of return, labour productivity should play a positive role while the effects of capital and floor productivities are indeterminate, depending on whether the investment on more capital intensive way of production can yield higher capital and floor productivities, and cover the cost of investment.

(v) Trade Variables

Hong Kong depends heavily on trade. The manufacturing products of Hong Kong is largely for export purpose,and not for domestic consumption. And imports from foreign countries may compete in the domestic market so that the domestic market structure is open to domestic and foreign competition. For the four industry groups we have chosen, exports sales accounted for about 51 percent of total

sales of domestic production and imports was approximately 78 percent of total domestic sales for both 1973 and 1978. The shares were very stable in these two years and the differences were less than one percent. The effects of trade variables are considered in our model as follows.

(1) Exports

As reviewed in chapter II, it was sometimes argued that a firm may not monopolize the world market even though it is domestically dominant. If it cannot exert a price-discrimination policy between the domestic and the world market, its profit rate will fall.[9]

However, the effect of exports on price-cost margins can be positive if the production establishments can exert a price-discrimination policy so that a higher price can be charged in the domestic market. A higher price-cost margin is resulted from export opportunities by capturing extra profit from foreign countries besides the domestic market.

We include the export variable by expressing export sales volume as a percentage of total domestic sales. When the ratio is high, the exports share becomes more important.

(2) Imports

Imports of similar products from foreign countries necessarily increase the competitiveness of the domestic market of a particular product. Hence import trade will reduce profit level of the domestic market and that of the locally dominant firms as well. We expect the coefficient of import variable to bear a negative sign. In Hong Kong, raw materials and equipment are imported. Our model will not consider their effects because we are analyzing the manufacturing industries, only the imports of manufacturing products are competitors in the

domestic market. The imports of raw materials and equipment will not cause significant effects on the market structure of manufacturing products. Just like the export variable, the import variable is also expressed as a ratio of import sales volume to total domestic sales.

(vi) Growth

To see the effect of growth on profitability, we have taken the average annual growth rates of sales to serve as growth variables. The average annual growth rates of sales between 1971 and 1973 are used to estimate the 1973 equation. For the 1978 equation, the average annual growth rates of sales between 1973 and 1978 are used to serve as growth variables.

Growth of the market, on the one hand, may enable the entry of new firms because of increased opportunity of selling their products, thus lowers the monopolistic profits of the industry, hence the coefficient of growth variable would carry negative sign. On the other hand, growth may reduce the competitive pressures between rival firms and produce temporary windfall profits, thus its coefficient carries a positive sign. As a result, the direction of the effect of growth on profitability is unknown before estimation of the model.

Formulation of the Model

After discussing the relevant variables affecting firms' profitability, we formulate a simple linear regression model as follows:

$$PCM = a + b\,CR + c\,GINI + d\,ADV + e\,CDR + f\,LPR + g\,KPR + h\,FPR + i\,XP + j\,MP + k\,GS + u$$

where

PCM = Average price-cost margin of the top three establishments,

CR = Three-firm concentration ratio,

GINI= Estimated Gini coefficient,

ADV = Advertising intensity,

CDR = Cost disadvantage ratio,

LPR = Labour productivity of the top three establishments,

KPR = Capital productivity of the top three establishments,

FPR = Floor productivity of the top three establishments,

XP = Export share of total domestic sales,

MP = Ratio of imports sales to total domestic sales,

GS = Average annual industry growth rate of sales,

u = Disturbance term which is assumed to satisfy all basic assumptions[10] and

a, b, c, d,....j and k are unknown parameters.

All variables in the equation are expressed in logarithmic forms except the growth variable. The coefficients represent elasticities. Because when some industries experienced decline in sales volume, their growth rates become negative, logarithmic transformation is hence impossible.

To account for the changes between the two studied periods, we also estimate equations where the change of the relevant variables are included.

Estimation Methods

Our study mainly applies the ordinary least squares (OLS) method of estimation. We perform tests for the problems of heteroscedasticity and autocorrelation (though it is rare in cross-section studies), and make transformations whenever necessary. We also discuss multi-collinearity problem among the explanatory variables.

Theoretically, all suggested variables may have effects on price-cost margins as described. Nevertheless, the theory of industrial organization is not very well defined and strong enough to guarantee

that all variables must have influences on price-cost margins, i.e. all variables associated with non-zero coefficients and are not superfluous variables. The true equation is not known. In addition, limited by the number of observations, we are not able to incorporate all variables into the equation simultaneously.

In this situation, we are forced to make use of the summary statistics to choose relevant variables and discard superfluous variables. The final model is established by including all variables which are not considered to be superfluous. To determine whether a variable is superfluous or not, one guideline can be followed:[11] when the inclusion of a variable does not increase R^2 sufficiently to increase the $\bar{R}^2$, then the variable is considered to be superfluous and is deleted from the regression. When inclusion of a variable increases R^2 sufficiently to increase $\bar{R}^2$, then it is included because it reduces the residual variance but does not affect the other regression coefficients. When its inclusion reduces the residual variance, this implies that the residuals have some systematic component which is being captured by the included variable, and error terms are thereby better specified.

Theoretical consideration is always the most important in econometric studies. The use of the above procedure may still have a chance for us to reject correct variables and include wrong variables. However, in our case where the true model is unknown and the theory is not well defined, and also it is impossible to incorporate all variables into the model, this procedure provides us a criterion to choose relevant variables in practice.

Moreover, to take advantages of the correlation of the residuals, we estimate the seemingly unrelated models. The results from the seemingly unrelated models will be compared with the OLS results.

FOOTNOTES TO CHAPTER IV

[1]For a discussion of this, see Stephen A. Rhoades and Joe M. Cleaver, "The Nature of the Concentration-Price/Cost Margin Relationship for 352 Manufacturing Industries: 1967," Southern Economic Journal, vol. 40 (July 1973 - Apr. 1974), pp. 90-102.

[2]Leonard W. Weiss, for example, compiled weighted average two-digit concentration ratios by using four-digit concentration data. See Leonard W. Weiss, "Average Concentration Ratios and Industrial Performance," Journal of Industrial Economics, July 1963, pp. 237-254.

[3]For example, when the concentration ratio of a three-digit industry is not available, we can estimate it by weighted average of its constituent four-digit industries where the shares of sales volume of the four-digit industries in the three-digit group serve as weights. However, such kind of approximation has aggregation and identification problems in practice and the concentration ratio estimates are subjected to substantial error, see Stanley E. Boyle, "The Average Concentration Ratio: An Inappropriate Measure of Industry Structure," Journal of Political Economy, vol. 81, No. 2 (Mar/Apr 1973), pp. 414-216.

[4]Stephen Martin, for example, has summarized seven measurements of profitability. See Stephen Martin, "Entry Barriers, Concentration, and Profits," Southern Economic Journal, vol. 46, nos. 1-4, (1979-1980).

[5]Our data of advertising expenditure includes the expenditure on advertising as well as other promotional activities. Furthermore, we only have data of the establishments with twenty persons or more engaged. We take these figures as figures at the industry level by assuming that the remaining small establishment spent very insignificant amount on advertising and other promotional activities.

[6]The problem was put forward conceptually in Joe S. Bain, Barriers to New Competition, Cambridge: Harvard University Press, 1956. For later quantitative applications, see Marshall Hall and Leonard W. Weiss, "Firm Size and Profitability," The Review of Economics and Statistics, vol. 49, (Aug. 1967), pp. 319-331.

[7]R.E. Caves, J. Khalilzadeh-Shirazi and M.E. Porter, "Scale Economies in Statistical Analysis of Market Power," The Review of Economics and Statistics, vol. 57 (May 1975), pp. 133-140.

[8]The cost disadvantage ratio faces certain limitations, one of them is that it measures only the disadvantage of small establishments in labour productivity but neglects other aspects of scale economies.

[9]If a firm cannot exert a price-discrimination policy between the domestic and the world market, the domestic price of its product would be the same as the world price. The domestic price would then be a competitive price which is lower than the monopolistic price without export opportunities. The price-cost margin in this case would be lower.

[10]The disturbance term is assumed to satisfy the basic assumptions of the classical multiple regression model, including (1) it has zero

expected value and constant variance for all observations; (2) it is normally distributed; and (3) the disturbance terms corresponding to different observations are uncorrelated. Transformation of the model is made if the assumptions are found not fulfilled. Moreover, the independent variables are assumed to be nonstochastic and there exists no exact linear relationship between two or more of the independent variables. See J. Johnston, Econometric Methods, 2nd edition, Tokyo: McGraw-Hill, 1972, pp. 121-123.

[11]Potluri Rao and Roger L. Miller, Applied Econometrics, Belmont: Wadsworth Publishing Company, Inc., 1972, pp. 34-38.

CHAPTER V

THE EFFECT OF CONCENTRATION ON PRICE-COST MARGINS OF MANUFACTURING INDUSTRIES — RESULTS OF ESTIMATION

The model specified in chapter IV has been estimated for individual industry groups and the estimation results are presented and discussed in the following.

Food Manufacturing Industries

The estimation results for food manufacturing industries are presented in Tables 8 and 10. Table 8 presents the ordinary least-squares (OLS) results and Table 10 the seemingly unrelated model results.

Equation 1 presented in Table 8 is the estimated equation for the group of food manufacturing industries in 1973. Equation 1s in Table 10 has the same specification as equation 1 but estimated with the equation for the group of electrical and electronic products manufacturing by seemingly unrelated method. The use of seemingly unrelated model estimation method can take advantage of the correlation of residuals of estimated equations for these two groups and gives more efficient estimates. The results indicate that the OLS results and the seemingly unrelated results have no substantial difference.

The equations for food manufacturing industries using 1973 data show that among the suggested variables, only the Gini coefficient and the cost disadvantage ratio are significantly related to price-cost margins. The former carries a positive sign and is significant

TABLE 8

OLS ESTIMATION RESULTS FOR FOOD MANUFACTURING INDUSTRIES

Dependent variable: PCM

Equation	Year	Intercept	GINI	CDR	ADV	XP	F	R^2	DW	n
1	1973	-0.6878 (-1.4523)	0.9913 (2.9988)**	-0.2556 (-2.2112)*			6.51**	0.7226	1.7415	8
2	1978	1.4450 (1.7068)	1.8939 (2.7635)**		0.2124 (2.5829)**		9.34**	0.7888	2.2526	8
3	1978	0.1423 (0.1908)	1.8787 (3.2301)**			-0.1430 (-3.3325)**	13.84**	0.8470	2.3589	8
4	1978	0.6241 (0.7702)	1.7961 (3.2215)**		0.1069 (1.2335)	-0.1011 (-1.9025)	10.69**	0.8891	2.4823	8

Note: 1. All variables are in logarithmic forms.

2. Values in parentheses are t-statistics.

3. * and ** represent statistics are significant at 10% and 5% levels respectively.

4. n = numbers of observations.

at 5 percent level while the latter carries a negative sign and is significant at 10 percent level. There is no serious problem of multicollinearity among the explanatory variables.

Equations 2 and 3 say that besides the Gini coefficient, the advertising intensity and the exports variables are found to be significantly related to price-cost margins in 1978.

As a measure of market power of dominant firms, the three-firm concentration ratio is not significantly related to price-cost margin, whereas the Gini coefficient is significant in both 1973 and 1978. However, the estimated elasticities of the Gini coefficients in these two years are different as reflected by estimated coefficients. The estimated elasticity in 1973 was less than unity while it was significantly larger than unity in 1978. This implies that the Gini coefficient was inelastic in affecting price-cost margins in 1973. But in 1978, the variable became elastic so that the effect of Gini coefficient on price-cost margins was more responsive in 1978 than in 1973.

Durbin-Watson tests[1] suggest that there is no misspecification problem for equation 1.[2] For equations 2, 3 and 4, the DW statistics fall in inconclusive regions.

Manufacture of Electrical and Electronic Products

Table 9 presents the OLS estimation results for the manufacture of electrical and electronic products. Table 10 presents results of seemingly unrelated model. Results in these two tables indicate that price-cost margins in both 1973 and 1978 are significantly related to three-firm concentration ratios. This variable is significant at 5 and 10 percent levels respectively in 1973 and 1978. Estimated coefficients of three-firm concentration ratios in both periods are

TABLE 9

OLS ESTIMATION RESULTS FOR MANUFACTURE OF
ELECTRICAL AND ELECTRONIC PRODUCTS

Dependent variable: PCM

Equation	Year	Intercept	CR	CDR	LPR	F	R^2	DW	n
5	1973	-1.5997 (-6.9815)***	0.6739 (3.9353)**	-1.6549 (-2.6520)**		9.65**	0.7943	1.7410	8
6	1978	-3.3213 (-5.7091)***	0.3173 (2.2919)*		0.6133 (2.7442)**	5.04*	0.6684	2.1620	8

Note: 1. All variables are in logarithmic forms.

2. Values in parentheses are t-statistics.

3. *, ** and *** represent statistics are significant at 10%, 5% and 1% levels respectively.

4. n = number of observations.

TABLE 10

ESTIMATION RESULTS FOR FOOD MANUFACTURING AND MANUFACTURE OF ELECTRICAL AND ELECTRONIC PRODUCTS BY SEEMINGLY UNRELATED METHOD

Dependent variable: PCM

Equation	Year	Group[a]	Intercept	CR	GINI	LPR	CDR	ADV	XP	System R^2	n
1s	1973	Food	-0.7323		0.9687		-0.276			0.7866	16
			(-1.5518)		(2.9400)**		(-2.3970)*				
5s	1973	Elec	-1.5766	0.6941			-1.6561				
			(-6.9037)***	(4.0640)***			(-2.6658)**				
4s	1978	Food	0.7116		1.8807			0.1045	-0.1038	0.8340	16
			(0.8844)		(3.4001)**			(1.2150)	(-1.9768)		
6s	1978	Elec	-3.2390	0.2926		0.5721					
			(-5.6026)***	(2.1286)		(2.5767)**					

Note: 1. All variables are in logarithmic forms.

2. Values in parentheses are t-statistics.

3. *, ** and *** represent statistics are significant at 10%, 5% and 1% levels respectively.

4. n = number of observations.

[a]Food and Elec represent food manufacturing and manufacture of electrical and electronic products respectively.

less than unity and the variable is found to be inelastic in response to one-percent change in price-cost margins.

In addition to the three-firm concentration ratio, the cost disadvantage ratio is found to be significant in 1973 while labour productivity is found to be significant in 1978 in affecting price-cost margins. Durbin-Watson tests[3] suggest that there is no misspecification problem for equations 5 and 6.

Textiles Manufacturing Industries

The OLS estimation results for textiles manufacturing industries are presented in Table 11 and the results of seemingly unrelated model are presented in Table 13 where the equations for the textiles manufacturing industries are estimated jointly with fabricated metal products manufacturing industries.

Equation 7 in Table 11 explains the effect of three-firm concentration ratio on price-cost margins in 1973. The result seems to show that price-cost margins cannot be explained well by three-firm concentration ratio. However, heteroscedasticity is observed in equation 7. Figure 2 shows that the estimated variance of residuals of equation 7 increases with the increase of the concentration variable, and that sector 3280 (bleaching and dyeing) is observed to be an outlier of this trend. The estimated residual of sector 3280 is far below the estimated residuals of other sectors and is out of Figure 2. The inclusion of this sector into the equation may lead to biasedness of the estimates after transformation of the equation. The rejection of the observation of sector 3280 and the adoption of transformation[4] of variables yield equation 7a, where the three-firm concentration ratio is found to be significantly related to the price-cost margin at 5 percent level. We can find in figure 3 that the heteroscedasticity problem has improved after the transformation. In the 1973 model,

TABLE 11

OLS ESTIMATION RESULTS FOR TEXTILES MANUFACTURING

Dependent variable: PCM

Equation	Year	Intercept	CR	LPRRATE[a]	F	R^2	DW	n
7	1973	-1.5410 (-6.6753)***	0.1869 (0.9479)		0.90	0.0647	1.7374	15
7a	1973	-1.1755 (-24.3129)***	0.6779 (2.8182)**		591.12***	0.9801	2.2935	14
8	1978	-1.7849 (-10.8738)***	0.3789 (3.4314)***	3.1023 (3.5483)***	8.87***	0.5965	1.9172	15
8a	1978	-1.7764 (-10.4948)***	0.3813 (3.3584)***	3.2208 (3.5015)***	8.58***	0.6093	2.0007	14

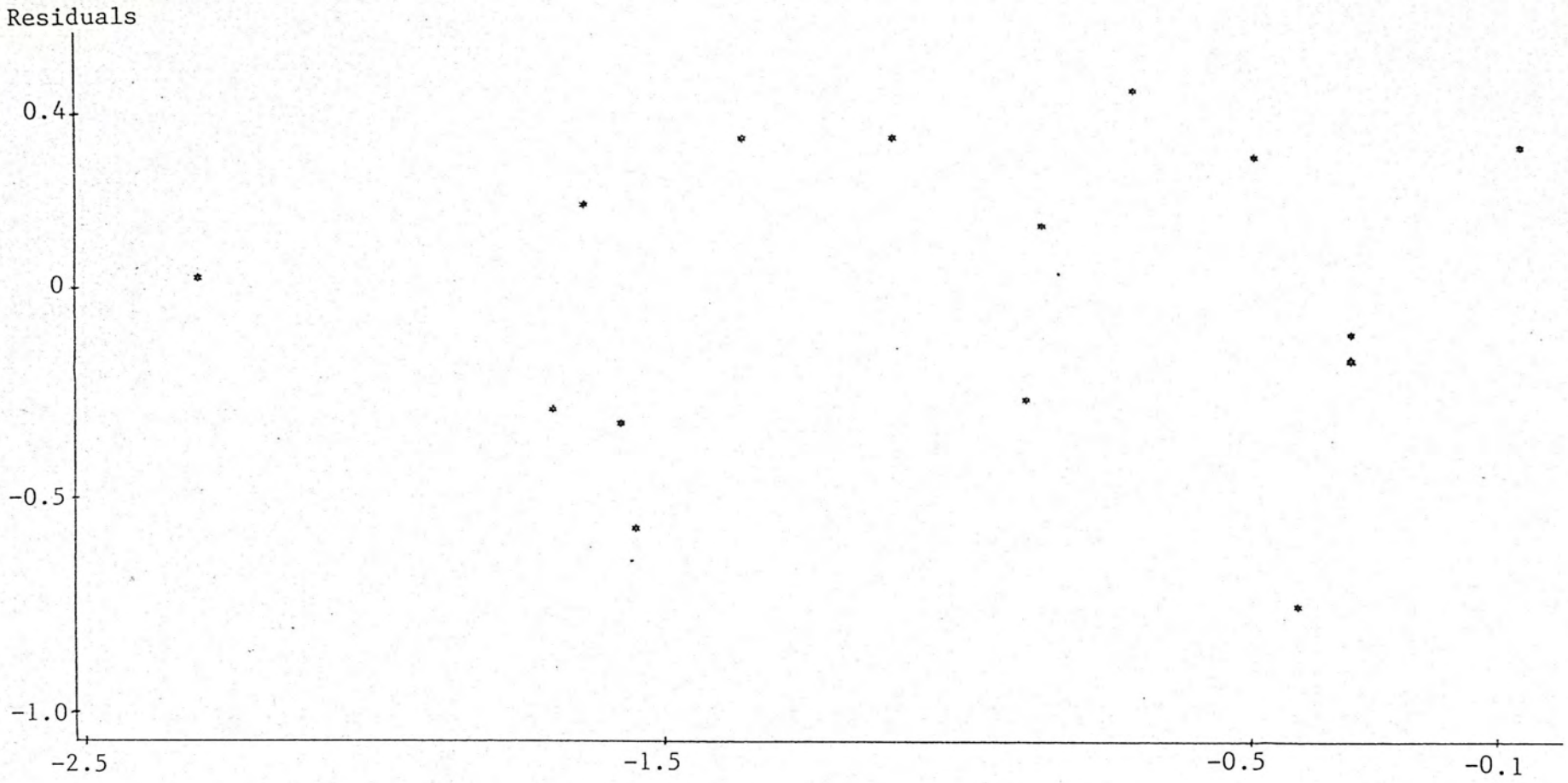
Note: 1. All variables are in logarithmic forms except LPRRATE, which is in linear form.

2. Values in parentheses are t-statistics.

3. ** and *** represent statistics are significant at 5% and 1% levels respectively.

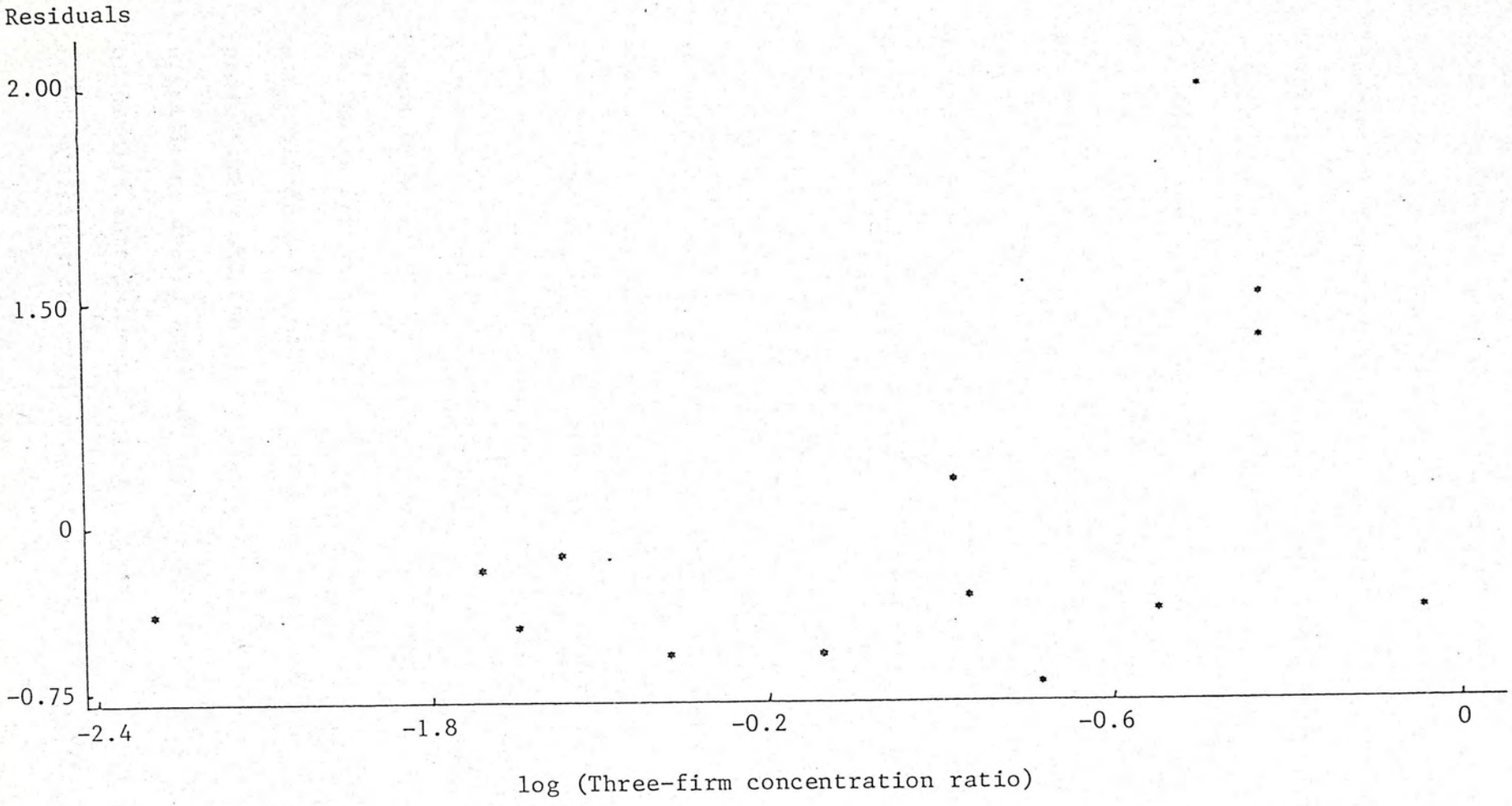
4. n = number of observations.

[a]LPRRATE represent average annual growth rate of labour productivity.



Note: Sector 3280 is out of the diagram

FIGURE 2: PATTERN OF RESIDUALS OF EQUATION 7



Note: Sector 3280 is out of the diagram

FIGURE 3: PATTERN OF RESIDUALS OF THE TRANSFORMED EQUATION OF EQUATION 7

no other suggested variables are found to be significantly related to the price-cost margin. The three-firm concentration ratio alone explains 98 percent of the variations in price-cost margins as reflected by the R^2 statistic in equation 7a.

Equation 8 shows the estimation result by fitting 1978 data. In order to compare with equation 7a of 1973, we also discard the observation of sector 3280 and obtain equation 8a. There seems no significant differences between equations 8 and 8a.

Equations using 1978 census data indicate that in addition to the three-firm concentration ratio, the growth rate of labour productivity also attributes to the variations in price-cost margins and the estimated coefficient of this variable is significant at 1 percent level. Durbin-Watson statistics suggest that none of the estimated models for this industry group have misspecification problem.[5]

Fabricated Metal Products Manufacturing

The OLS results of fabricated metal products manufacturing industries are presented in Table 12 and the results of seemingly unrelated model are presented in Table 13.

The estimation results of using 1973 and 1978 census data suggest that the market structure variables are significantly related to price-cost margins. In 1973, the three-firm concentration ratio is found to be significant. In 1978, the three-firm concentration ratio is insignificant but the Gini coefficient is a significant variable using a 5 percent level of significance. Moreover, the labour productivity and the floor productivity variables are found to be significant during 1973 and 1978 respectively if a 10 percent level of significance is used. Durbin-Watson tests[6] suggest that there is no misspecification problem for the 1973 and 1978 equations.

TABLE 12

OLS ESTIMATION RESULTS FOR MANUFACTURE OF FABRICATED METAL PRODUCTS

Dependent variable: PCM

Equation	Year	Intercept	CR	GINI	LPR	FPR	F	R^2	DW	n
9	1973	-3.9261 (-2.9159)**	0.5238 (2.2556)**		1.2823 (1.9950)*		4.70**	0.4609	2.3204	14
10	1978	1.9012 (1.5204)		0.9530 (2.6760)**		-0.5245 (-2.1584)*	6.85**	0.5547	2.7745	14

Note: 1. All variables are in logarithmic forms.

2. Values in parentheses are t-statistics.

3. * and ** represent statistics are significant at 10% and 5% levels respectively.

4. n = number of observations.

TABLE 13

ESTIMATION RESULTS FOR TEXTILES MANUFACTURING AND MANUFACTURE OF FABRICATED METAL PRODUCTS BY SEEMINGLY UNRELATED METHOD

Dependent variable: PCM

Equation	Year	Group[a]	Intercept	CR	GINI	LPR	LPRRATE	FPR	System R^2	n
7as	1973	Tex	-1.1746 (-24.2987)***	0.6802 (2.2820)**					0.9616	28
9s	1973	Met	-3.9013 (-2.8981)**	0.5238 (2.2563)**		1.2701 (1.9764)*				
8as	1978	Tex	-1.7787 (-10.5095)***	0.3785 (3.3340)***			3.1989 (3.4784)***		0.5806	28
10s	1978	Met	1.9187 (1.5348)		0.9489 (2.6648)**			-0.5289 (-2.1771)*		

Note: 1. All variables are in logarithmic forms except LPRRATE, which is in linear form.

2. Values in parentheses are t-statistics.

3. *, ** and *** represent statistics are significant at 10%, 5% and 1% levels respectively.

4. n = number of observations.

[a]Tex and Met represent textiles and fabricated metal products manufacturing respectively.

A Brief Summary of the Empirical Results

From our empirical results, the relation between price-cost margins and concentration measures is quite clear. In all equations estimated, concentration measures are found to be significantly and positively related to price-cost margins. We have used two different measures of market structure: three-firm concentration ratios and Gini coefficients. The former takes account of the top three firms in an industry while the latter takes account of both the top firms and the remaining ones in an industry. They behaved differently in different equations. Most of our estimation results suggested a positive relationship between three-firm concentration ratios and price-cost margins, that is, the top firms are able to influence the market structure and generate more profits. However, three-firm concentration ratios were not significant in all equations. In equations for food manufacturing industries using 1973 and 1978 data and those for fabricated metal products manufacturing industries using 1978 data, the Gini coefficients are found to be significant, which implies that the smaller firms not treated as top firms in an industry can, however, influence the market power of top firms. If these smaller firms are able to compete with the largest firms in an industry, the market power of the latter must be much lower than the situation where if there are smaller firms in an industry, but they are very weak competitors. Three-firm concentration ratios fails to take into account for the power of smaller firms but the Gini coefficient does better in this aspect. The group of fabricated metal products manufacturing industries in 1978 can serve as an illustrative example for this. As we have stated in chapter III, the substantial number of new entrants into this industry group in 1978 lowered three-firm concentration ratios for majority of industry sectors. The market

power of the top three firms in an industry was weakened and so three-firm concentration ratios could not explain successfully variations in price-cost margins in 1978 even though it did very well in equations using 1973 data.

The food manufacturing industries, however, give a different picture. From Table 14, we observe that this industry group can be considered as the most concentrated one compared with the other three groups studied in terms of three-firm concentration ratios in 1973 and 1978. Nevertheless, Gini coefficients of this group fell far below the other three groups in 1973 and was just higher than that of textiles manufacturing industries in 1978. The Gini coefficients showed that firms in food manufacturing industries were relatively evenly distributed and small firms had relatively more important positions than in other groups. This may possibly be the reason why three-firm concentration ratios cannot explain well the effect of price-cost margins but Gini coefficients can do a good job.

As for entry barriers, the advertising intensity is an important variable in explaining the effect of price-cost margins in the equation for food manufacturing industries fitting 1978 data. The result is not surprising as we can find from Table 15 that food manufacturing industries had the highest advertising intensity among the four industry groups under study. The other three groups spent very little on advertising and promotional activities. In 1973, the food manufacturing industries spent on the average less than one percent of sales volume on advertising, and this small amount of expenditure does not serve well as a measure of entry barrier. In 1978, the advertising-sales ratio had been doubled and reached 1.7 percent and thus there was a relatively significant relationship between price-cost margins and advertising.

TABLE 14

AVERAGE THREE-FIRM CONCENTRATION RATIOS AND GINI COEFFICIENTS OF SELECTED MANUFACTURING INDUSTRY GROUPS IN HONG KONG (IN PERCENTAGES)

	1973		1978	
	Average three-firm concentration ratio	Average Gini coefficient	Average three-firm concentration ratio	Average Gini coefficient
Food	56.42	24.88	55.09	29.47
Electrical and electronic products	38.48	33.40	40.65	32.76
Textiles	43.44	31.35	29.48	23.98
Fabricated metal products	42.06	29.14	35.04	30.31

Source: Computed from Tables 3 and 4.

TABLE 15

AVERAGE ADVERTISING INTENSITIES OF SELECTED MANUFACTURING INDUSTRY GROUPS IN HONG KONG (IN PERCENTAGES)

Industry	Year	
	1973	1978
Food	0.867	1.723
Electrical and electronic products	0.146	0.479
Textiles	0.067	0.185
Fabricated metal products	0.142	0.337

Source: Computed from Census and Statistics Department, 1973 Census of Industrial Production, Hong Kong: Government Printer, 1977; and _____. 1978 Survey of Industrial Production, Hong Kong: Government Printer, 1981.

On the other hand, the estimated coefficients of cost disadvantage ratio were not significant in equations of food manufacturing industries and the manufacture of electrical and electronic products using 1973 data. The results suggest that top firms using advantages of economies of scale as an entry barrier was not common in all manufacturing industries.

Labour productivity was found to be significant in the equation of fabricated metal products manufacturing using 1973 data. But in 1978, the labour productivity variable is no longer significant, instead the floor productivity variable contributes to the explanation of variation in price-cost margins. A possible explanation may be that the industry is shifting from more labour intensive way of production to a style of production utilizing more floor area.

As for the electrical and electronic products manufacturing industries, it had been pointed out in the report of the Advisory

Committee on Diversification in 1979 that

> The growth in capital assets and in net output per worker in recent years, and the high proportion of relatively skilled workers employed in the industry in relation to other manufacturing industries suggest improvement in productivity....[7]

The improvement in labour productivity can be observed in equations of this industry group using 1978 data. It is found that the labour productivity variable has a positive and significant effect on price-cost margins. The result shows the importance of attracting high quality labour into this industry and labour training programs to equip new labour with better skill of production.

Similar to the case of the manufacture of electrical and electronic products, the textiles industries also had a rapid growth in labour productivity in the 1970's. The increase in labour productivity was largely due to the use of new technology. The cases of the spinning sectors and weaving sectors in the textiles industry group, for example, had been stated in the report of the Advisory Committee on Diversification in 1979:

> The improved productivity (of the spinning sector).... is attributable largely to the introduction and increasing use of open-end spindles.[8]
>
> .... the improved productivity in the weaving sector was the result of technological change, represented by the introduction of high speed looms and shuttleless looms.[9]

The regression results for textiles industries, however, does not suggest the labour productivity variable an important variable as is the case in electrical and electronic products manufacturing industries. Nevertheless, estimated equations of textiles industries using 1978 data indicate that the rate of change in labour productivity directly explain variations in price-cost margins. This implies that, other things being constant, the faster the growth in labour productivity, the higher the rate of return will be. The shift of firms in textiles industries to produce high quality products in the late 1970's reflects the requirement of high labour productivity.

Trade variables had no significant relationship with price-cost margins in all estimated equations except for equation 3 (the equation for food manufacturing industries using 1978 data), in which export shares are found to be negatively related to price-cost margins.

The import variable carries negative signs as expected when it was included in all estimated equations. However, its coefficient was not significant in any equation. As for the exports variable, there was no prior expectation for the sign of its associated coefficients in different equations. Some of the estimated coefficients of the export variable have positive signs while others have negative. The insignificance of trade variables is a somewhat surprising result for an open economy such as Hong Kong. Yet this is not the unique study which indicates the insignificance of trade variables although the case is rare for open economies. In the consumer goods industries of Australia, one study[10] shows that import did not play any significant role in affecting price-cost margins. Another study of the member countries of the European Economic Community[11] shows that the export shares of the manufacturing industries of Italy did not affect price-cost margins. But in both these cases, no satisfactory explanation was given by the authors. In Hong Kong, there is also no good reasons to account for the insignificance of trade variables. We guess that although dominant firms can manipulate prices to a certain extent, the prices are still competitive when compared with foreign commodities, so that trade does not affect their price-cost margins.

The growth variable is not significant in all equations estimated, indicating a weak relation between growth and price-cost margins in cross-section study for manufacturing industries. But for some industries, we find that the growth variable is significantly related to the change in price-cost margins between 1973 and 1978 and we will discuss this in the next chapter.

FOOTNOTES TO CHAPTER V

[1]Our tests are based on the extended tables for the Durbin-Watson statistics computed in N.E. Savin and Kenneth J. White, "The Durbin-Watson Test for Serial Correlation with Extreme Sample Sizes or Manly Regressors," Econometrica, vol. 45, No. 8 (November 1977), pp. 1989-1996.

[2]The Durbin-Watson test was done by using a 1% level of significance.

[3]The tests were done by using 1% and 5% levels of significance for equations 5 and 6 respectively.

[4]Transformation of the variable is based on the assumption that the variance of the disturbance term is proportional to the square of the concentration variable so that

$$\text{var}\ (u_i) = c\ (CR_i)^2$$

where c is a nonzero constant, CR_i = concentration ratio.

Our regression model $PCM_i = a + b\ CR_i + u_i$ is now transformed to

$$\frac{PCM_i}{CR_i} = b + \frac{1}{CR_i} + \frac{u_i}{CR_i}$$

and the transformed error term is homoscedastic.

[5]The tests were done at 5% level of significance.

[6]The tests were done by using 5% and 1% levels of significance for the 1973 and 1978 equations respectively.

[7]Report of the Advisory Committee on Diversification 1979, Hong Kong: Government Printer, 1979, paragraph 99.

[8]Ibid, paragraph 75.

[9]Ibid, paragraph 76.

[10]David K. Round, "Price-Cost Margins, Industry Structure and Foreign Competition in Australian Manufacturing, 1968-69 to 1972-73", Industrial Organization Review, vol. 6 (1978), pp. 151-168.

[11]Emilio Pagoulatos and Robert Sorensen, "Foreign Trade, Concentration and Profitability in Open Economies", European Economic Review, vol. 8 (1976), pp. 255-267.

CHAPTER VI

WHAT FACTORS CONTRIBUTE TO THE CHANGE OF PRICE-COST MARGINS

The results presented in chapter V suggested that in cross-section studies for 1973 and 1978, concentration measures are important variables in determining price-cost margins. However, we may want to know whether the change of price-cost margins between the two years can be explained by the change of concentration measures. We can study the relationship between change in price-cost margins and change in concentration measures. This is the main theme of the present chapter and the estimation process is described below.

The Model

The variables used in this chapter are essentially those suggested in chapter IV, the only difference is that we put special emphasis on the change of the variables. We employ the change of price-cost margins between 1973 and 1978 as the dependent variable. For concentration measures and entry barriers, we also take account of the change of the variables between 1973 and 1978. For other variables such as productivity variables, total sales and trading volume, we take their average annual growth rates.

The model is estimated in linear form.[1] Both ordinary least-squares (OLS) and seemingly unrelated model estimation method are used. Moreover, the same regression strategy specified in chapter IV is used.

Results of Estimation

The results of estimation are presented in Tables 16 and 17. Table 16 presents the OLS results and Table 17 presents the seemingly unrelated model results in which food manufacturing industries and

TABLE 16

OLS ESTIMATION RESULTS FOR CHANGES IN PRICE-COST MARGINS

Dependent variable: ΔPCM (Change in price-cost margin)

Equation	Group	Intercept	ΔCR	ΔCDR	LPRRATE	GS	GE	F	R^2	DW	n
11	Food	0.0306 (1.7915)	0.7245 (4.3571)***					18.98***	0.7598	1.1563	8
12	Elec	-0.0657 (-3.1004)***	0.2629 (2.2493)*		0.2895 (3.5728)**			20.11***	0.8894	1.0221	8
13	Elec	-0.0483 (-2.5320)*			0.3621 (6.6858)***	-0.0442 (3.2622)**		32.66***	0.9289	0.8716	8
14	Elec	-0.0498 (-2.3693)*	0.0729 (0.4650)		0.3389 (4.3891)**	-0.0361 (-1.5988)		18.43***	0.9325	0.8883	8
15	Text	-0.4324 (-3.4694)***		-2.0607 (-3.2406)***			1.3068 (2.6807)**	8.79***	0.6150	2.0852	14
15a	Text	-1.0940 (-580.5120)***		-3.7489 (-274.0783)***			3.4183 (1.2718)	169529.10***	0.9999	2.4974	14

Note: 1. Food, Elec and Text represent food, electrical and electronic products and textiles industries respectively.

2. ΔCR and ΔCDR represent changes in CR and CDR respectively.

3. LPRRATE, GS and GE represent average annual growth rates of labour productivity, sales volume and export volume respectively between 1973 and 1978.

4. Values in parentheses are t-statistics.

5. *, ** and *** represent statistics are significant at 10%, 5% and 1% levels respectively.

6. n = number of observations.

TABLE 17

SEEMINGLY UNRELATED ESTIMATION RESULTS FOR CHANGES IN PRICE-COST MARGINS

Dependent variable: ΔPCM (Change in price-cost margin)

Equation	Group	Intercept	ΔCR	LPRRATE	GS	System R^2	n
11s	Food	0.0309 (1.8125)	0.7502 (4.6563)***			0.9449	16
14s	Elec	-0.0529 (-2.6581)*	0.0191 (0.1426)	0.3485 (5.3117)***	-0.0326 (-1.6950)		

Note: 1. Food and Elec represent manufacture of food and electrical and electronic products respectively.

2. ΔCR represents change in CR.

3. LPRRATE and GS represent average annual growth rates of labour productivity and sales volume respectively between 1973 and 1978.

4. Values in parentheses are t-statistics.

5. *** represents statistics are significant at 1% level.

6. n = number of observations.

the manufacturing industries for electrical and electronic products are jointly estimated. The estimation results for individual industry groups are discussed in the following.

Food Manufacturing

It was found that for food manufacturing industries only the change in three-firm concentration ratio is a significant variable and it is positively related to the change in price-cost margins. As can be seen in equations 11 and 11s, the explanatory variable is significant at one percent level.

The cross-section results in chapter V show that for food manufacturing industries, the Gini coefficient is an important variable in explaining the total variation of price-cost margins. In dealing with the change of price-cost margins between 1973 and 1978, the change in Gini coefficient is found to be an insignificant variable. The results seem to be contradictory. But it should be noted that the change in Gini coefficient does not necessarily reflect the change of market power of dominant firms. A change in Gini coefficient only indicates a change in distribution of firms. A change in concentration ratio better reflects the change of market power of dominant firms, thus it is not surprising to see that the change in concentration ratio has a significant effect on the change in price-cost margins, but the change in Gini coefficient does not. As a matter of fact, our analysis is based on the assumption that the change in price-cost margins of dominant firms partly comes from the change in their market power. Durbin-Watson tests[2] show that there is no misspecification problem for equation 11.

Manufacture of Electrical and Electronic Products

For this group of industries, three variables are found to be significant in explaining the change of price-cost margins. The

change in three-firm concentration ratio is significant at 10 percent level in equation 12. The average annual growth rate of sales volume is significant at 5 percent level in equation 13. The average annual growth rate of labour productivity is found to be a significant variable in all equations estimated for this group of industries. The variable is significant at 5 percent level in equations 12 and 14 and is significant at one percent level in equations 13 and 14s. The result is reasonable as we have discussed in the previous chapter that this group of industries experienced a rapid improvement in labour productivity in the later 1970's, which contributed to the change in price-cost margins.

Durbin-Watson tests for the equation show that the DW statistics of both equations 12, 13 and 14 fall in the inconclusive region and we can neither accept for reject the hypothesis that misspecification problem exists.

Textiles Manufacturing

Despite the fact that in cross-section studies three-firm concentration ratio is found to be a significant variable in affecting price-cost margins in both 1973 and 1978 as presented in chapter V, we found that the change in price-cost margins between the two years cannot be explained by the change in concentration measures. The variables we find significant are the change in cost disadvantage ratio and the growth rate of export volume. This phenomenon can be observed by examining equation 15 of Table 16. Equation 15 was estimated by OLS method.

However, the problem of heteroscedasticity occurs in equation 15. From figure 4 we can observe that the estimated variance of residuals of the equation increases with the increase of the growth rate of export volume. Transformation[3] of equation 15 is made, and the

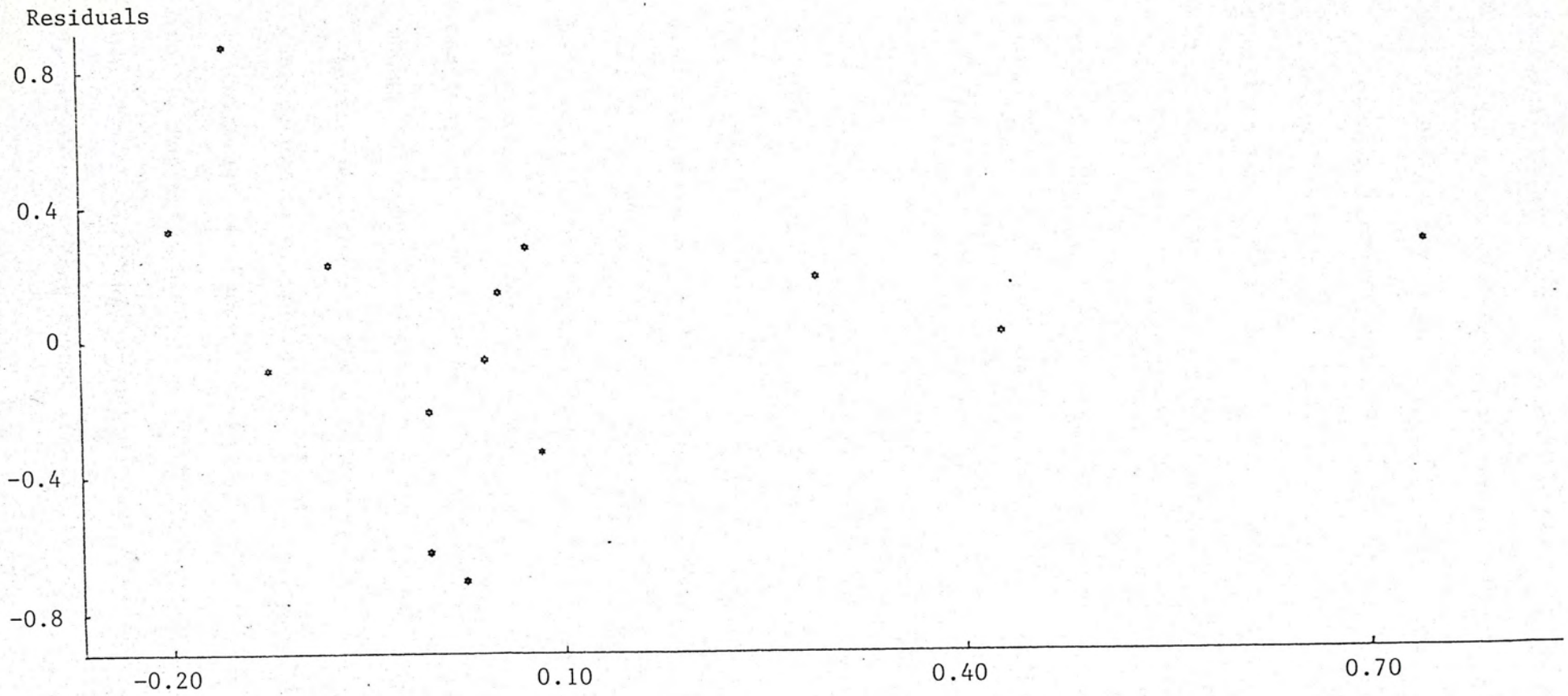
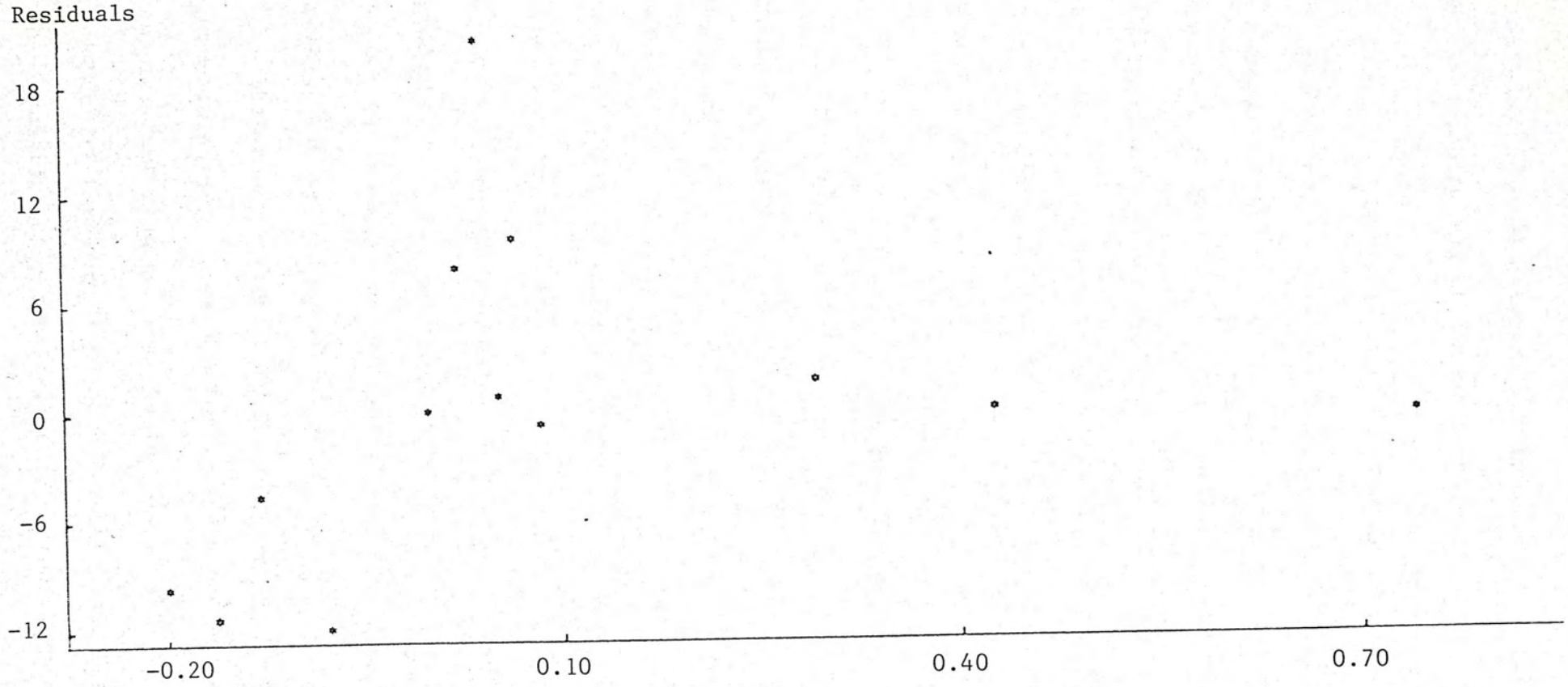


FIGURE 4: PATTERN OF RESIDUALS OF EQUATION 15

transformed equation is estimated by OLS and the corresponding coefficients are given in equation 15a. Figure 5 shows the residuals of the transformed equation and we can observe that the heteroscedasticity problem has improved.

Growth of export volume is no longer a significant variable in the transformed equation as shown in equation 15a. The result indicates that this variable is not a truely important variable in explaining the change in price-cost margins between 1973 and 1978.

Similar to the manufacture of electrical and electronic products, textiles industries experienced an improvement in labour productivity in the 1970's. Labour productivity still plays an important role in explaining the change in price-cost margins between 1973 and 1978. The variable enters the equation in different functional form. It is not the change in labour productivity itself explains the change in price-cost margins, it is the change of the cost disadvantage ratio found to be a significant variable. In our definition the cost disadvantage ratio is the ratio of labour productivity of small establishments to labour productivity of the top three establishments. We can still find that the improvement in labour productivity of the top three establishments influences the change in their price-cost margins when holding other factors constant. However, the effect of change in labour productivity in dominant firms does not directly explain the change in their price-cost margins as is the case in the manufacture of electrical and electronic products. In textiles industries, the change in labour productivity in firms in addition to the top three has to be taken into consideration. The top firms can improve their price-cost margins only when they improve their labour productivity faster than their smaller counterparts.



FITURE 5: PATTERN OF RESIDUALS OF THE TRANSFORMED EQUATION OF EQUATION 15

Durbin-Watson tests suggest that the hypothesis of no mis-specification to be accepted for equation 5 at five percent level and for equation 15a at one percent level.

Manufacture of Fabricated Metal Products

As for fabricated metal products, none of the suggested variables in our model is found to be significant in explaining the change in price-cost margins between 1973 and 1978. We find in chapter V that completely different variables appear in models of cross-section nature using 1973 and 1978 data, therefore it is reasonable that there is no common variable that determines the change in price-cost margins between these two years.

A Brief Summary

A major finding of this chapter is that a change in concentration measures does not necessarily lead to a change in price-cost margins. The result is complementary to those studies where concentration measures are found to be significant in determining price-cost margins.

The change in price-cost margins may also be affected by factors other than the change in concentration of the market. In the industries of textiles manufacturing and manufacture of electrical and electronic products, both with rapid improvement in labour productivity, the change in labour productivity of the production units plays an important role in the determination of the change in price-cost margins.

The growth variables do not show any significant effect in determining price-cost margins in cross-section studies of previous chapter, but from the results in this chapter, growth rates of sales volume have negative effects on the change of price-cost margins in the industries of electrical and electronic products. Similar to the results of previous chapter, the trade variables are found to have no significant effect in explaining the change in price-cost margins.

The economic implications of the estimation results in this chapter as well as in chapter V will be discussed in the next chapter.

FOOTNOTES TO CHAPTER VI

[1]We do not estimate the model in logarithmic form because we find that some of the variables have negative values so that logarithmic transformations are impossible.

[2]The Durbin-Watson test was done by using a 5 percent level of significance.

[3]Transformation was made by assuming that the variance of the residuals is proportional to the square of the annual growth rate of export volume, i.e.,

$$\text{var}\ (u_i) = k\ (GE_i)^2$$

where k is a nonzero constant and GE is the growth rate of export volume.

Equation 15 was originally specified as

$$\Delta PCM_i = a + b\,\Delta CDR_i + c\ GE_i + u_i$$

The equation was transformed to

$$\frac{\Delta PCM_i}{GE_i} = c + a\,\frac{1}{GE_i} + b\,\frac{\Delta CDR_i}{GE_i} + \frac{u_i}{GE_i}$$

and the transformed error term in this equation becomes homoscedastic.

CHAPTER VII

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions of the Study

The study used 1973 and 1978 four-digit census data to examine the general structure-performance hypothesis in the manufacturing industries of Hong Kong. Empirical models are built and estimated and the relationship between industry concentration and price-cost margins is examined in detail. The empirical results of our estimation lead to several conclusions.

The cross-section estimation results suggest that the price-cost margins of dominant firms in an industry is positively correlated with the degree of concentration of the industry. Although the results are confined to selected industry groups only and cannot be generalized to all sectors of the economy, we can at least arrive at a conclusion that the selected industry groups had not behaved exactly as what had been predicted by the theory of perfect competitive market.

A perfectly competitive market is characterized by homogeneous products and its constituent firms are price takers. Moreover, a perfectly competitive firm earns its 'normal profit' only and is not able to make 'extra profit' due to its insignificant market power.

The assumption of homogeneous products is somewhat unrealistic in the real world. Products are seldom identical even within the same firm. However, we can relax our assumption to include close substitutes rather than homogeneous products. The classification of industries, though problematic in practice, is aiming to include close substitutes

in industry codes. It is commonly accepted in empirical studies that the four-digit level of aggregation includes close-substitutes, and our study utilizes data derived from four-digit industry codes as basic observations. We made assumption that firms within the same industry should yield similar levels of profit in perfect competition. Obviously our empirical results show that the selected industry groups even do not satisfy this modified condition. Concentration variables are found to be significant in all cross-section equations. This suggests that dominant firms in more concentrated industries are likely to yield higher price-cost margins.

The dominance of a few leading firms in an industry would result in welfare loss of consumers and problem of income distribution. In an oligopolistic market where only a few leading firms dominate, the price of products is higher and the quantity supplied is lower when compared with a perfectly competitive market. This phenomena results in loss of consumer surplus. Moreover, as the dominant firms earn more 'extra profit' than its counterparts, distribution of income can get worse. These aspects are not reflected by our estimation results. It is not possible to tell whether there exists any collusive actions among leading firms that lead to deterioration of welfare of the economy. The higher price-cost margins of dominant firms in a more concentrated market may not be due to their collusive actions to maximize their joint profit.

Though market structure is an important variable in economic analysis, concentration does not explain everything. Besides concentration measures, price-cost margins also depend on such factors as economies of scale, productivities and growth. Our empirical results gave evidence to the effects of these variables.

For industry sectors in textiles manufacturing and manufacture of electrical and electronic products, labour productivity was found to be increasingly important in the determination of the level of price-cost margins especially in the late 1970's. For establishments in these groups of industries, improvement in labour productivity would be a more appropriate means to boost their price-cost margins than to increase their share of activity in the market. The success of the effort to increase the share of an establishment in a particular market depends on actions of other establishments, while the success of taking actions to improve labour productivity can be internally determined by the establishment itself.

Trade variables do not have significant effects on price-cost margins. The case is rare in the study of an open economy. Yet we can find some models in which trade variable is insignificant.[2] The import variable is an insignificant variable in our models, which may be due to data imperfection.[2] Other than data imperfection, we can virtually conclude that trade creates no extra profit for dominant firms in our selected industry groups. The explanation for insignificance of trade variables may be that dominant firms may be able to manipulate the domestic market to a certain extent, so that their product price is still competitive in the world market, thus neither exports nor imports affect their price-cost margins. Therefore, it is not surprising to find that trade variables have no significant effect on price-cost margins in Hong Kong.

The growth variable was found to be significant in explaining the change in price-cost margins between 1973 and 1978 for the manufacture of electrical and electronic products. This industry group had the highest growth rate among the manufacturing industries of Hong Kong in the 1970's. For the other three moderately growing

industries, the growth variable has no effect on price-cost margins. The findings illustrate that a rapid growing industry permits new entrants which weakens the monopolistic power of dominant firms. The significance of advertising as an entry barrier is limited to food manufacturing industries in 1978. It seems to have little effect on market structure and profitability for other manufacturing industries.

The findings of our study enable us to discuss policy implications in the following section.

Policy Implications

To improve efficiency and income distribution of an economy, one possible way is to increase the competitiveness of the economy. But in Hong Kong, anti-trust policies aim at lowering market concentration and increasing competition of the market may not be possible because with the emphasis of positive non-interventionism,[3] government intervention to the market is kept at minimum.

The doubt on the effectiveness of using anti-trust policies is strengthened by the analysis of the change in price-cost margins. Besides food manufacturing industries, the change in concentration has either very little or virtually no effect on the change in price-cost margins in other selected industry groups. Policies used to alter the state of concentration will therefore have little effect in changing price-cost margins. In addition, with the practice of low profit tax in Hong Kong, redistribution of income through tax policies is impossible. Being afraid of their unfavourable impacts on attracting more capital investment to Hong Kong, the government is not willing to raise the profit tax rate or to use a more progressive tax system which will possibly lower the profitability of large firms and discourage more investment.

The government can, however, improve competitiveness of the economy indirectly by means other than anti-trust laws or tax policies since concentration is not the only element that affect price-cost margins. One of the possible ways is to increase the competitive ability of the small establishments so that they can compete with the large ones.

Labour productivity was found to be an important variable in the determination of price-cost margins. Therefore, an improvement in labour productivity of small establishments will improve their ability to compete. Improvement of labour productivity depends on two conditions: one, adoption of new technology and two, recruitment of high quality labour. Small establishments are in unfavourable positions in attracting high quality labour and in obtaining information of new technology. Moreover, the limited capital cannot afford labour training programs and investment in new technology. The importance of difference in labour productivity is reflected in some cases, say, food manufacturing industries and manufacture of electrical and electronic products in 1973, where the economies of scale variable is significant. In these industries the difference in labour productivities between the top firms and the remaining firms accounts for the variation in price-cost margins. To increase competitiveness of the economy, a more convenient way of giving loans is needed for small establishments.[4] Also programs of introducing new technology to small establishments are needed. Small establishments can attract higher quality labour only after they have gained a better position of competition.

The growth variable which is found to be significant in the manufacture of electrical and electronic products suggests that new entrants are able to compete with dominant firms in fast growing industries. In terms of efficiency, the finding supports that 'extra

profit' is reduced for dominant firms with the entrance of new establishments, and production of the industry is more efficient because the market has become more competitive. It also suggests that new and prospective industries should be introduced into Hong Kong — and this is just what has been done in the industrial diversification program during the recent years.

Limitations of the Study

Finally, let us examine the limitations of the present study. The most serious limitation of our model is that it is basically a model on the production side. The demand side of the industry sectors is neglected. To check the effects of demand elasticity and export quota on concentration as well as price-cost margins, we have to consider and integrate the demand side of the industries into the model. Nevertheless, so far there exists no well-developed empirical model in integrating the effect of demand. Furthermore, an attempt of estimating demand elasticities is prevented because of the lack of prices and quantities data to the four-digit level of aggregation of the ISIC. Similarly, data of export quota to the four-digit level of aggregation of the ISIC is not available.

Moreover, our study is of a static nature and is not a dynamic analysis. We can only realize the positive relation between concentration measures and price-cost margins, but we are not able to tell the process how a high concentration leads to high return.

Another limitation of our model is the absence of time-series data of concentration which makes us unable to perform time-series estimation. Hence inference can only be made on the basis of cross-section studies. Forecasting of the trend is particularly difficult. Despite the limitations of our model, our analysis will essentially hold if we restrict ourselves on the supply side of the industries only.

FOOTNOTES TO CHAPTER VII

[1]For example, in the sub-sample results in David K. Round, "Price-Cost Margins, Industry Structure and Foreign Competition in Australian Manufacturing, 1968-69 to 1972-73", Industrial Organization Review, vol. 6 (1978), pp. 151-168, the import variable is found to have no significant effect on price-cost margins in consumer goods industries. The case of Italy estimated in Emilio Pagoulatos and Robert Sorenson, "Foreign Trade, Concentration and Profitability in Open Economies," European Economic Review, vol. 8 (1976), pp. 255-267, show that export shares have no effect on price-cost margins.

[2]The import data is obtained from the Census and Statistics Department which is unpublished to the public. The data is computed from converting external trade statistics classified on the basis of the United Nation Standard International Trade Classification (SITC) to statistics reclassified by the International Standard Industrial Classification (ISIC). Because of the imputed differences in definitions of industries of the two classification systems, the statistics are inevitably biased to a certain extent.

[3]Philip Haddon-Cave, "The Making of Some Aspects of Public Policy in Hong Kong," in David G. Lethbridge (ed.), The Business Environment in Hong Kong, Hong Kong: Oxford University Press, 1982, pp. xi-xix.

[4]The Loans for Small Industry Scheme was the only direct assistance introduced and operated by the government between 1972 and 1976. The scheme was not successful and ceased operation in 1976. Recently, a scheme of giving loans to small establishments led by the Hongkong and Shanghai Banking Corporation seems much more successful.

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